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HANDBOOK FOR THE DESIGNER AND CRAFTSMAN

MURAL PAINTING

BY

F. HAMILTON JACKSON

EXAMINER TO THE BOARD OF EDUCATION IN PRINCIPLES OF ORNAMENT
VICE-PRESIDENT OF THE SOCIETY OF DESIGNERS

WITH ILLUSTRATIONS FROM PHOTOGRAPHS

London
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GENERAL PREFACE TO THE SERIES

If there is one quality which more than another marks the demand of the present day it is the requirement of novelty. In every direction the question which is asked is not "Is this fresh thing good? Is it appropriate to, and well-fitted for, its intended uses?" but "Is it novel?" And the constant change of fashion sets a premium upon the satisfaction of this demand and enlists the commercial instinct on the side of perpetual change. While there are directions in which this desire is not altogether harmful, since at least many monstrosities offend our eyes but for a short time, a full compliance with it by the designer is likely to prove disastrous to his reputation, and recent phases in which an attempt has been made to throw aside as effete and outworn the forms which have gradually grown with the centuries, and to produce something entirely fresh and individual, have shown how impossible it is at this period of the world's history to dispense with tradition, and, escaping from the accumulated experience of the race, set

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forth with childlike *naïveté*. Careful study of these experiments discloses the fact that in as far as they are successful in proportion and line they approach the successes of previous generations, and that the undigested use of natural *motifs* results not in nourishment but in nightmare.

The object aimed at by this series of handbooks is the recall of the designer and craftsman to a saner view of what constitutes originality by setting before them something of the experience of past times, when craft tradition was still living and the designer had a closer contact with the material in which his design was carried out than is usual at present. Since both design and craftsmanship, as known until the end of the eighteenth century, were the outcome of centuries of experience of the use of material and of the endeavour to meet daily requirements, it may be justly called folly to cast all this aside as the fripperies of bygone fashion which cramp the efforts of the designer, and attempt to start afresh without a rag of clothing, even if it were possible. At the same time it is not intended to advocate the direct copyism of any style, whether regarded as good, bad, or indifferent. Some minds find inspiration in the contemplation of natural objects, while others find the same stimulus in the works of man. The fashion of present opinion lays great stress upon the former

source of inspiration, and considers the latter heretical, while, with a strange inconsistency, acclaiming a form of design based upon unnatural contortions of growth, and a treatment which is often alien to the material. It is the hope of the author to assist the second class of mind to the rivalling of the ancient glories of design and craftsmanship, and perhaps even to convert some of those whose talents are at present wasted in the chase of the will-o'-the-wisp of fancied novelty and individuality. Much of what appears to the uneducated and ill-informed talent as new is really but the re-discovery of *motifs* which have been tried and abandoned by bygone masters as unsuitable, and a greater acquaintance with their triumphs is likely, one would hope, to lead students, whether designers or craftsmen, to view with disgust undigested designs indifferently executed which have little but a fancied novelty to recommend them.

It is intended that each volume shall contain an historical sketch of the phase of design and craft treated of, with examples of the successful overcoming of the difficulties to be encountered in its practice, workshop recipes, and the modes of producing the effects required, with a chapter upon the limitations imposed by the material and the various modes of evading those limitations adopted by those who have not frankly accepted them.

PREFACE

IT must be premised that this handbook does not concern itself with the practice of the ordinary painter and decorator, in the sense in which those words are generally used, but only with those higher forms of decoration for which the assistance of the artist is required.

The modes of decorating a wall-surface by means of paint divide themselves roughly into those in which the colour is solely on the surface of the wall and those in which the colour penetrates that surface; though this is perhaps merely a question of the thickness of the skin of colour and the thoroughness with which the colour is attached to the surface.

Another mode of division is afforded by the difference of the medium employed to attach the colours, and in which they are ground or with which they are mixed, and both of these modes of classification and differentiation will be made use of in this handbook.

The first process treated of is true fresco, "buon fresco," which was for a long time considered the ideal

mode of decorating a wall-surface, and which prescribes certain conventions which are undoubtedly advantageous to the work; fresco secco and tempera come next, as being closely connected with it, and the modern processes of water-glass or soluble silicate follow, for which absolute permanence is claimed. In all these processes the medium in which the colours are ground is pure water. Next the processes in which wax and essential oils are used are described, and finally those which are simply modifications of ordinary oil painting applied to a wall. The preparation of the wall itself is of the greatest importance to the permanence of any painting which may be attached to it, or executed upon it, and a few general remarks may be made which are applicable to all grounds; but the mode of final treatment differs so greatly in different processes that details must be given of the preparation under each head, necessitating a certain amount of repetition for which the author hopes he may be forgiven.

While a certain amount of historical detail is inseparable from the treatment of such a subject as mural painting, it is evident that anything like a complete summary of styles and schools, giving their distinguishing marks and characteristics, cannot be attempted in handbooks of the nature of those in this series without making them overbulky and unwieldy; and there has, therefore, been no attempt to give

anything but the merest suggestion in the present case.

The following books have been consulted: Vitruvius, and Pliny's *Natural History;* Didron's translation of the Mount Athos Manual, Hendrie's *Theophilus,* Mrs. Herringham's *Cennini* and Mrs. Merrifield's translation of the same book, Sir Charles Eastlake's *Materials for a History of Oil Painting,* Hittorff's *Restitution du temple d'Empédocle à Selinonte,* Cros and Henry's *L'Encaustique et les autres procédés de peinture chez les anciens,* Paillot de Montabert's *Traité complet de la peinture,* Taylor's *Manual of Fresco and Encaustic Painting,* Latilla's *Treatise on Fresco, Encaustic, and Tempera Painting,* Catalani's *La Chiesa di S. Angelo in Formis,* Schulz's *Denkmäler der Kunst Unter Italiens,* Helbig's *Wandgemälde der vom Vesuv verschütteten Städte Campaniens* and other papers, Burckhardt's *Le Cicerone,* Forni's *Manuale del pittore restauratore,* Armenini's *Dei Veri Precetti della Pittura,* Lopez' *Il battistero di Parma,* Tommaselli's *Della Cerografia,* Selvatico on Oil Painting and Tempera, The chronicle of Fra Salimbene, Émeric-David's *Histoire de la peinture au moyen âge,* Mérimée's *Handbook of Oil Painting,* Gambier Parry's account of his process of Spirit Fresco, Armitage's *Lectures on Painting,* Professor Church's *Chemistry of Paints and Painting,* Professor Baldwin Brown's *Lectures on Art, The Journal of the*

Franklin Institute, *The Journal of the Society of Arts*, *The Art Journal* and the *Quarterly Review* and several Encyclopædias, the *Zeitschrift für Bildende Kunst*, and many articles in the publications of the various Italian historical societies known as the *Reali Deputazioni per Storia Patria*, published in the different districts of Italy. The object has been to focus, as far as may be, the information scattered through many publications. Those interested in encaustic painting will find excellent practical notes in Carpentier's *Notes sur la peinture à la cire cauterisée.*

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The Ascension. Wall-painting by Cimabue in the Upper Church of S. Francesco, Assisi . . . ,, 18

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The Infant Christ awakes in S. Francis's arms as he is constructing a "Presepe" for the Christmas festival. Wall-painting by Giotto in the Upper Church of S. Francesco, Assisi . . . . ,, 26

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Wall-painting by Taddeo Gaddi. Lower Church of S. Francesco, Assisi . . . . . ,, 30

In this the combination of flat painting and raised and stamped plaster-work, once gilded, is well seen, which produced a very decorative effect.

Wall-painting of the fourteenth century in S. Maria Novella, Florence . . . . . *Facing page* 34

Here the object of the framing appears to be to copy details of marble inlays such as were common in the decorative architecture of some years earlier. The picture and framing still form one whole.

Christ bearing the Cross. By Nicolò di Pietro Gerini. In the Sacristy, Santa Croce, Florence . . . ,, 40

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The Death of the Virgin. Fresco by Taddeo Bartoli in the chapel of the Palazzo Pubblico, Siena . ,, 44

Portion of the Great Crucifixion by Fra Angelico in the chapter-house of S. Marco, Florence . . ,, 50

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Adoring Angels. Fresco by Benozzo Gozzoli in the chapel of the Palazzo Riccardi, Florence . . ,, 54

Coronation of the Virgin. In the apse of the cathedral, Spoleto. Fra Filippo Lippi's last work ,, 58

Fresco by Filippino Lippi in the Brancacci chapel of the church of the Carmine, Florence. The deliverance of S. Peter from prison . . . ,, 62

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Portion of fresco by Botticelli in the Sistine chapel, Rome. The history of Moses . . . . . ,, 66

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The composition is very fine, with many graceful figures, and the mastery over material almost absolute. The heads are many of them fine in type, and well drawn and modelled, as the detail shows.

The Birth of the Virgin. Fresco by Domenico Ghirlandajo, in the church of S. Maria Novella, Florence . . . . . ,, 74

Detail from the same. Portrait of Lucrezia Tornabuoni ,, 78

S. Jerome in his Study. By Domenico Ghirlandajo, in the church of Ognissanti, Florence . . . *Facing page* 82

These show the work of a most excellent craftsman, who rarely rose to an imaginative grasp of his subject. The figure of Lucrezia Tornabuoni is most beautifully and perfectly executed; but she and most of the other figures lend no assistance to the realisation of the subject. The S. Jerome is almost photographically accurate in all its details, and is a miracle of workmanship in fresco; but the details attract too much attention, and architectonic arrangement has disappeared, much to the disadvantage of the work from the point of view of decoration.

The Resurrection. Fresco by Luca Signorelli, in the Cappella Nuova, Orvieto cathedral . . . ,, 86

The ceiling of this chapel was commenced by Fra Angelico, who was called to Rome to paint the chapel of S. Nicholas, in the Vatican, before he had completed it. Signorelli succeeded him, and painted the series of frescoes from the Book of Revelation which are on the walls, covering the lower parts with arabesques and medallions of poets. In the corner of the fresco of the preaching of the false prophet he has introduced the portraits of himself and Fra Angelico.

Detail from the same . . . . . ,, 90

This detail shows the enormous advance made by Signorelli in the representation of the nude, prophetic of the triumphs of Michel Angelo. It is particularly interesting as showing the possibility of improvement in a mature artist, for Signorelli was over sixty at the time these frescoes were painted, and they are by far the best things which he produced.

Roundels from the ceiling of the Collegio del Cambio, Perugia. By Perugino . . . . . ,, 94 and 96

These roundels of the planets are set among arabesques, and show great inventiveness in composition and dexterity in filling the space.

Ceiling-paintings by Perugino, in the Stanza dell' Incendio del Borgo, in the Vatican . . . ,, 98

This ceiling shows the same excellences in even greater measure, and, I think, is one of the most perfectly successful ceilings in existence, the colour and arrangement being excellent, and the figures filling the spaces perfectly without distortion. It is to be noted also that arabesques and subjects fit each other, and make a whole without either striving for the mastery, and that Raffaelle, when he painted the walls of this room, refrained from touching the ceiling, feeling no doubt that he could do nothing better.

Fresco by Pinturricchio, in the library of Siena Cathedral. The Betrothal of Frederick III. to Eleanora of Portugal . . . . . *Facing page* 102

The series of frescoes of which this is one represent events in the life of Æneas Sylvius Piccolomini, who became pope as Pius II. They were all painted in fresco and completed in tempera, by which means they gained great brilliancy and clearness, and are so well preserved that they might have been painted but a few years ago. The artist shows absolute command over his material.

Fresco by Andrea Mantegna, in the Camera degli Sposi, in the Castle, Mantua . . . . . ,, 106

These charming little "putti" are above the door of entrance. The subjects show Lodovico Gonzaga, his son Francesco, and his wife Barbara, with their court. A good deal of gold is used in the curtains, etc., and in the centre of the ceiling is a perspective of a balustraded opening, through which figures look down—the first example of a practice so much abused at a later period.

Portion of the ceiling of the Sistine chapel, Rome. The Prophet Isaiah. By Michel Angelo . . ,, 110

Another portion of the same. The Fall, and Sacrifice of Noah . . . . . ,, 112

Creation subject from the same . . . . . ,, 114

The first of these shows the arrangement of the lower part of the barrel vault, and the other two subjects from the central portion of the ceiling. Attention may be drawn to the alteration in the scale of the figures and the simplification of the composition between the Sacrifice of Noah and the Creation subject.

The "Disputa del Sacramento." Fresco by Raffaelle, in the Camera della Segnatura, in the Vatican . ,, 118

This was the first fresco painted by Raffaelle after his arrival in Rome, and one which he never surpassed in colour and arrangement, although his technique became more masterly.

Fresco by Raffaelle, from the Sala di Costantino, in the Vatican . . . . . ,, 120

The breadth of treatment and charm of this little figure are beyond all praise.

The Ecstasy of S. Catherine of Siena. Fresco by Sodoma, in her chapel, S. Domenico, Siena . . ,, 124

This is a clever composition, and a fair example of Sodoma's work, though not so celebrated as the series from the life of S. Benedict at Monte Oliveto. The combination of actual and painted architecture is an ingenious mode of removing the wall and substituting space—an æsthetic mistake.

The Burial of S. Catherine of Alexandria. Fresco by Luini, now in the gallery of the Brera, Milan . *Facing page* 128

A small but charming work by the artist, more really pleasing than the enormous fresco in S. Maria degli Angioli, Lugano, or the pretentious works at Saronno.

Spirit fresco at Lyndhurst church. By Lord Leighton, P.R.A. The Parable of the Ten Virgins . ,, 132

The King's Robing-Room, Houses of Parliament. Frescoes by W. Dyce, R.A. . . . . ,, 136

Fresco of "Hospitality." By W. Dyce, R.A. From the King's Robing-Room . . . . . ,, 140

These are described in the text. The knightly virtue of Hospitality is expressed by the reception of Sir Tristram at the Round Table.

The "Goldenes Dachl," Innsbruck. A portion of the Castle of Frederick of the Empty Pockets . ,, 146

External wall-painting at Hallstadt. Scenes from the Passion . . . . . ,, 152

These two illustrations show combinations of decorative paintings and architectural carved forms, giving an idea of the richness which often characterised the buildings of the Mediæval and Early Renaissance periods.

The originals of these illustrations are photographs collected here and there in Italy, some of them many years ago. There are among them photographs made by Naya of Venice, by Alinari of Florence and Lombardi of Siena, and by Moscionni of Rome. The negatives of Dyce's frescoes have been made for me (by the kind permission of H.M. Office of Works) by my friend, Mr. J. Cooper Ashton, the companion of many delightful Italian journeys, to whom the interior of S. Piero in Grado is also due.

MURAL PAINTING

HISTORICAL SKETCH

If the paintings in the porch and the corridor of the Minoan palace at Cnossos, of which very interesting drawings were exhibited at the Winter Exhibition of the Royal Academy of Arts in 1903, are executed in true fresco, as was stated by Dr. Evans in his paper read before the Royal Institute of British Architects, the process must be held to be of extreme antiquity, since the date assigned to them is the eighteenth century B.C.; but judging from the drawings one would say that they were some form of tempera or "secco," the mode in which the surface is shown to have peeled off in places and the elaborate patterns painted upon the ground-colour in contrasting colours being unlike the technique of true fresco. The discovery of large quantities of gypsum (sulphate of lime) in the process of excavation makes it almost certain that the medium used was a tempera medium, as true fresco is a process in which *carbonate* of lime is formed and encloses the colours applied to the wet wall, while sulphate of lime sets so quickly that even if it pro-

duced a similar enclosing crystallic film it would be impossible to execute any elaborate painting upon the surface between the laying of the plaster and its drying. The Egyptian wall-paintings are all executed in some form of tempera, as far as one can judge from the analysis made of fragments of coloured plasters, which always show some form of gum or glue, as are those which have been found in the Etruscan tombs.

Sig. Conestabile, in describing the interesting tombs near Orvieto discovered by Sig. Golini, speaks of the wall-paintings as "frescoes," and M. Des Vergers uses the same word in speaking of other Etruscan tombs at Cære and Chiusi; but I think the word is only used loosely, since the latter describes one tomb in which armour and other objects are carved in stone and then coloured, in the same manner.

Pliny gives details which suggest that something called fresco was not unknown to the Greeks. He says that Muræna and Varro in their ædileship had a fine painting on the plaster of a wall at Lacedæmon cut away from the bricks and transported in wooden frames to Rome for the purpose of adorning the Comitium. The extract now given probably refers to tempera. "Ludius, who lived in the time of the late Emperor Augustus, was the first to introduce the fashion of covering the walls of our houses with most pleasing landscapes, representing villas, porticoes, orna-

Pompeian wall-painting. House of the Vettii.

To face page 2.

mental gardening, woods, groves, hills, fishponds, canals, rivers, sea shores, and anything else one could desire: varied with figures of persons walking, sailing, or proceeding to their villas on asses or in carriages. Then, too, there are others to be seen fishing, fowling, or gathering in the vintage. In some of his decorations there are fine villas to be seen, and roads to them across the marshes, with women making bargains to be carried across on men's shoulders, who move along slipping at every step and tottering beneath their load; with numberless other subjects of a similar nature, redolent of mirth and of the most amusing ingenuity. It was this artist, too, who first decorated our uncovered edifices with representations of maritime cities, a subject which produces a most pleasing effect, and at a very trifling expense." He also says that in a temple at Lanuvium, which was in ruins, were to be seen nude figures of Atalanta and of Helen, which were of the greatest beauty, painted on the wall and in perfect preservation. Also that the Emperor Caligula wished to remove them, but that the plaster would not allow of the operation being carried out successfully. At Pompeii lime is found in all the colours and in most of the walls only two horizontal joinings in the plaster are to be detected, though the figure subjects sometimes seem to have been inserted Probably, therefore, they used some traditional method

of colouring plain surfaces in fresco handed down from antiquity. Otto Donner says that many of these wall-paintings are true fresco, and gives as one reason that in some places they had been subjected to a sufficient heat to change yellow ochre into red, which would have destroyed any tempera medium, but the colours still remained on the walls. He goes on to say that it would have given him great pleasure to find a real tempera picture, but that in his opinion all are true fresco—that analysis found no wax in any painted plaster except in the vermilion grounds, nor signs of animal nor vegetable colours except the rosy colour, which is probably "purpurissimum," added "a tempera." Tempera was only used for retouching and to assist the manipulation of certain colours, and the wax varnish to protect those which were likely to prove fugitive. Requeno says, however, that Winckelmann and the academicians found that when the paintings were washed with water the subject came away, leaving the coloured ground beneath.

Among the Greek painters Agatharcus and Democritus studied and used perspective, at the time of Alcibiades, who commissioned the former to paint his house, and when he refused, pleading overwork, locked him up till he consented. Apollodorus, who was a little later, was the first real artist, according to Pliny, though Agatharcus had already introduced back-

grounds of landscape, etc., and thus enabled figures to be combined in a pictorial composition. His celebrated contemporaries were Zeuxis and Parrhasius in Ionia, Eupompus in Sicyon, and Timanthes in Cynthos. Pamphilus of Amphipolis developed the principles of Eupompus and established the school of Sicyon; he was the master of Apelles, Melanthus, and Pausius. By his influence the art of drawing was made of primary importance in Greek education. His pupils went through a ten years' course, with corresponding fees, a talent each year. The course comprehended outline-drawing, painting in fresco, encaustic, etc., anatomy, arithmetic, and geometry. Pliny cites Varro as saying that under the Roman kings the Etruscans decorated the temples before Greeks were employed there.

The most ancient Christian paintings are in the catacombs of S. Domitilla (SS. Nereus and Achilleus), on the Via Ardeatina, and S. Priscilla, on the Via Salara, Rome. Many interesting paintings occur also in the catacombs of SS. Pietro and Marcellino, S. Prætextatus, and SS. Trasone e Marcellino, etc. The best period is the latter part of the second century and the beginning of the third. Paintings of a later date are for the most part weaker copies of the subjects treated at this period. Biblical subjects are rare. Those most frequently occurring are "The Good

Shepherd," with a pendant called "L'orante," the soul separated from the body. The Baptism of Christ, Noah in the Ark, the Resurrection of Lazarus, the Feeding of the Five Thousand, and the History of Jonah sometimes appear, generally with a symbolic meaning. Towards the fifth century an attempt at portraiture becomes visible in the "Orantes." As long as the catacombs were used for burial (till the commencement of the fifth century) saints have no attributes, and no nimbi appear, not even for Christ and the Apostles. The figure of the Virgin only appears in rare paintings of the Adoration of the Magi, a curious difference from the practice of later periods. The "Concilio Illiberitano," held in 305, forbad paintings of God or the Trinity, "picturas in ecclesiis esse non debere ne quod colitur et adoratur in parietibus depingatur." At this period the cultus of saints had not commenced. A few figures of saints with attributes appear from the fifth to the eighth centuries, and after this period painting was dethroned by mosaic for a time and composition became traditional. In the eleventh century paintings appear again, examples of which may be seen at S. Urbano alla Caffarella near Rome, legendary subjects, probably painted about 1011, by some local artist, with an attempt at expression and action; and similar fragments are at S. Agnese.

Interior of the Church of S. Piero in Grado, near Pisa.

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There is no doubt that mural painting never ceased, even during the darkest portion of the Middle Ages, though no doubt the works then executed had small value as works of art. When Attila descended into Italy in 452, destroying and devastating, he saw on the wall of the emperor's palace at Milan a picture of the two Augusti, Theodosius II., the Illuminator, and Valentinian, on golden thrones, with Scythians crouching before them: he therefore commissioned an artist to paint on the opposite wall himself on his throne and the two emperors before him, one with a miller's sack on his shoulder filled with gold, while the other was pouring the contents of a similar sack at his feet. The palace of Theodolinda was decorated with wall-paintings (591), and several of the Lombard churches bear signs of having been painted. In the sixth century Venantius Fortunatus says that the walls of S. Giustina, Padua, were painted with the deeds of S. Martin. In 731 Gregory III. reconstructed S. Crisogono in Trastevere, and ornamented it with paintings. At the time of Charlemagne (800) it was held, both in Italy and France, that a church ought to be covered with paintings inside, and it was not thought to be finished until they had been executed. The names of a few painters of this period have come down to us, such as Aribert or Auripert da Lucca, of the eighth century,

and Eribert da Verona, of the ninth century, but most of those mentioned were miniaturists. Many paintings on wall and roof were executed in France in the tenth century, and also at Milan, Monte Cassino, Salerno, and the celebrated abbey of Farfa. Hugues, of the convent of Moutier-en-Der, executed in 999 new paintings in the church of Chalons-sur-Marne to replace those of more ancient date decayed by efflux of time. Several painters are named also as living in the monastery of S. Gall. The church of the ancient port of Pisa, S. Piero in Grado, said to be the place where S. Peter first set foot in Italy, built between 600 and 800, is decorated with wall-paintings which are believed by Pisan archæologists to have been executed before 1000 A.D., though Burckhardt sets them down as of the thirteenth century, and thinks that the artist also worked at Assisi in the upper church of S. Francis. It has arches coloured red and white, and between the arches are coloured decorations. Above the lines of the arches are little tabernacles in incipient perspective, within which are polychrome figures of all the popes up to Leo III. (795). Above this is another little decoration in relief, painted also, and above again a large decoration in compartments, with the history of the martyrdom of S. Peter, after which there is a row of windows with painted arches between, and in the false windows,

which have pilasters and polychrome arches, are accurately painted wooden shutters, now open and now half closed, and angels peeping through the latter looking into the sanctuary. The painting, that is to say, forms the principal part of the architectural design. The church of S. Angelo in Formis (ad Formas), so called because of the numerous aqueducts which led from the mountain down to Capua, about four and a half miles from Capua, is a very interesting church from the early frescoes which it contains, apart from the remains of the temple of Diana Tifaitina, worked up into its structure and fittings, on the site of which it stands. It replaces a more ancient church, which was also painted, and the paintings are mentioned as being there in the seventh century by Giovanni Diacono. It belonged at that time to Monte Cassino, but was taken from it by the Capuan archbishop, and in the time of Desiderius, Riccardo, prince of Capua, obtained it by exchange from Archbishop Hildebrand, and gave it again to Monte Cassino. This was in 1065. Desiderius wished to build a monastery there for forty monks, and rebuilt the church also, which had become ruinous. It was then made so fine, the artists employed being no doubt some of the Greeks who were working for him at Monte Cassino, that the Capuan clergy had recourse to Gregory VII. to get it back, but vainly.

The walls are covered with frescoes, some of which have suffered very much, but the subjects on the nave walls and in the apse are tolerably preserved. The Last Judgement, which occupies the west wall, is a good deal damaged, but is the strongest of the compositions. The others are subjects from Old and New Testament history, figures of prophets, etc., and in the semi-dome of the apse is a colossal figure of Christ, seated, and blessing the people, with the Holy Ghost above and the symbols of the Evangelists round, while below are the archangels Michael, Gabriel, and Raphael with circular nimbi, and two other figures with square nimbi (which shows that they were living at the time), Desiderius or Pope Victor III. with a church in his hand, and S. Benedict holding a book with the beginning of the Benedictine rule, though why S. Benedict should have a square nimbus one does not understand. On the summit of the hill is another little church which is also decorated with ancient frescoes.

Several French and German painters of the eleventh century were greatly celebrated, and attained high ecclesiastical positions, for most of them were cloistered artists. S. Bernward became bishop of Hildesheim; he died in 1023. Adelard II. of Louvain, was elected abbot of S. Tron in 1055. Herbert and Roger of Rheims remained simple artists, but Thiemon,

Interior of the Church of S. Angelo in Formis, Capua.

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painter, sculptor, and professor of literature, was made archbishop of Salzburg in 1090. There were numbers of less celebrated painters also.

To return to Italy. Giunta Pisano was a friend of Frate Elia, the builder of S. Francesco at Assisi, and certainly painted in that building; he was, perhaps, the teacher of Cimabue. Vasari's patriotic assertion that Italian painting commenced in Florence with the latter has often been disproved, but it may be worth while to give here some further details, which show that other parts of Italy had priority over Florence in this matter, though one must acknowledge that the Florentines showed greater aptitude for progress in the art than their neighbours, who started before them in the race. At Reggio, in the Emilia, there were painters living in 1096 and 1103, and a "Maestro Ardimento" is mentioned as working there in 1100; on the upper portion of the façade of the cathedral, which dates from the twelfth century, there are still remains of early paintings. The façade of the cathedal at Parma (finished in 1106) was also painted, and Fra Salimbene records that Guidolino da Enzola was much put out by the boys throwing stones at the *paintings* and sculptures of the cathedral and baptistery. He used to run after them and beat them "as if he had been appointed custodian, though he only did it from zeal to God and divine love." The

paintings in the baptistery are rather later—of the first half of the thirteenth century—and are signed Nicolà of Reggio. The figures have movement and attitudes of passion, the difficulty of rendering the expression of the face being got over by giving the bodily gestures which express emotion almost as fully. A document of 1068 mentions Fr. Everard, priest and painter, and Fra Salimbene says that in 1233 every parish had a standard with its patron saint painted on it, that on the standard of the Parmese taken in 1248 to the siege of Vittoria, Frederick the Second's new town, was the effigy of the Madonna crowned by Jesus, and that above the covering of a lamp of the confraternity of S. Francesco were to be seen the Apostles coloured. At Bologna a painter, Gundulfus, signs as witness to a public contract as early as 1090, and the anonymous "p. f.," whose pictures are now in the Crucifixion Church of S. Stefano, dated them 1113 and 1115, according to the historians who saw them in their original position; and in the time of Malvasia (1686) many paintings existed dated from 1173 to 1217. He asserts that at Bologna they no longer followed the Greek tradition long before it was abandoned in Florence, perhaps owing to the law schools, where at the end of the twelfth century 14,000 students attended Azzone's lectures on Roman law, and where in consequence there was a large

school of writers and miniaturists, for it was comparatively easy to repeat on a large scale what had been painted small in the books. Odofredus, writing in the middle of the thirteenth century, says "our writers nowadays have become painters, our painters writers," referring to the school of miniature painters. There is a notice of 1250 regarding certain paintings which were perishing in the Communal palace, representing the taking of the castle of Roffeno (which happened in 1243). They were to be removed and the surface covered with marble instead, but the order was cancelled shortly after and their restoration commanded. In S. Stefano are a few remains of Romanesque paintings of the twelfth century, and there are some of the next century in other places, especially above the sarcophagi outside S. Giacomo. Names of painters of the thirteenth century are recorded at Ravenna and Rimini, and at Padua in 1271 the podestà, Tommaso Giustiniani, ordered the pictures already existing in the Palazzo del Ragione to be whitened over and other figures painted above the secretaries' seat. In 1286 Vincenzo *quondam* Bartoloto, of the town of Cambroso, in his will orders payment to be made to the painters who, in the churches of Rosara and Cambroso, had painted S. Benedict and S. Daniel. An amusing and a terrible incident which occurred in Bologna show

that painters were common enough a little later. In 1293 the podestà proclaimed the prohibition of arms, and engaged a painter to paint the prohibited objects on the wall of the Palazzo Pubblico. At night, after the "terza suono," the third ringing of the bell, had emptied the streets of people (for they had to go home then as they did at Viterbo), the painter made a little scaffold and commenced painting, with a boy holding a lantern to light him at his work. All at once a certain Giovanni di Geminiano ran up, took a brush, scrabbled over what was done, snatched the lantern from the boy, broke it, and ran away. He was taken subsequently and condemned to prison and a fine of twenty-five lire. In 1305 Giacomo di Calusco killed his son for marrying a woman with whom he was in love. He was taken and tortured horribly, and the podestà had the execution painted *to add to his gallery of such things* "ad perpetuam rei memoriam."

At Subiaco, in the Sacro Speco, are some early frescoes, some of which, signed "Mag: Conxolus," are more Italian than Greek in type; while others, by Fr. Oddo, not equally good, but with a foretaste of Giotto, include a portrait of S. Francis of Assisi, with the square nimbus, indicating that he was then alive (it has been repainted). There is a figure of Innocent III. and the text of the diploma given by him to the abbey on June 24th, 1213. Since S. Francis was canonised

Wall-painting at Subiaco, early thirteenth century.
POPE GREGORY IX. CONSECRATING THE CHURCH.

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in 1229 by Gregory IX., who is shown consecrating the church in another painting, it is probable that some of these date from about 1215, twenty years before the birth of Cimabue and forty before that of Giotto. There are also paintings of the eleventh century in an abbey near Majori, between Salerno and Amalfi, and in other places near, as well as at S. Agnese, S. Lorenzo fuori, and the lower church of S. Clemente at Rome, and at S. Zeno, Verona, of a somewhat later date. In the Emilia the art of this period endeavours to get away from asceticism and make its figures young. It has abandoned the Byzantine types both in attitude and drapery, and tries to put freedom and life into the figures. The number of colours used is limited. At Subiaco there is also an endeavour after naturalism, but with a stronger feeling for the decorative effect of the painting. At S. Angelo in formis the design is Byzantine. The death of this style in Italy may be reckoned from the time when painting was preferred to mosaic. In Tuscany at the beginning of the thirteenth century it was certainly still master, and from it Italian painting was developed by the addition of life, beauty, and freedom, little by little. I have gone into these details because many people still suppose that there was no art in Italy before the time of Cimabue and Giotto.

Cimabue's finest paintings are in the two churches of

S. Francesco at Assisi, and from the point of view of decoration it is difficult to see that Giotto made any step forward, though he did so no doubt in dramatic conception and natural gesture. The paintings which modern criticism allows to be Cimabue's are: the Madonna with four angels on the west wall of the transept in the lower church, the paintings on the roof in the upper church representing the four Fathers of the Church, the Evangelists with angels (in the transept), medallions of Christ, the Virgin and two saints resting on angels like Victories and surrounded with festoons issuing from vases held by naked genii (very remarkable from the point of view of decoration), and perhaps the two upper series of the nave with sixteen scenes from the Old and sixteen from the New Testament, and the Ascension and Descent of the Holy Ghost, with medallions of SS. Peter and Paul above on the wall of entry. The lives of Christ and of S. Francis in the lower church, attributed to him by Vasari, are not his. Burckhardt ascribes them to the artist who painted in S. Piero in Grado near Pisa, which he thinks is of this period. The life of S. Francis in the upper church is principally by his pupils, and shows the transition to Giotto. Giotto (1267–1337) marks a great step forward, but his facial types were not as beautiful as those of Duccio of Siena, whose work, if individual beauty were the supreme end

of painting, would be supreme among all produced in the thirteenth and fourteenth centuries, without excepting Orcagna even. His technique was Byzantine, and he may almost have been said to have looked at nature through Byzantine glasses, so great is the influence of that style upon his imagination. Giotto did not push naturalism to extremes, but regarded his work still from the decorative standpoint, thinking of general effect and the scheme of colour first. He had the gift of seizing the central fact of his subject and making the most of it, an excellence which did not descend in equal measure to all his pupils. Undoubted works of his may be seen in the Arena chapel, Padua; the vault over the high altar in the lower church of Francis at Assisi, illustrating the vows of the Franciscan order, Poverty, Chastity and Obedience, and the apotheosis of S. Francis, which are perhaps his most celebrated works; at Florence in the Peruzzi and Bardi chapels in S. Croce, and in the Incoronata at Naples; and in other places where the assistance of his pupils is more evident. Among them the most important were: Taddeo Gaddi (died 1366), Giotto di Maestro Stefano called Giottino, and Maso di Banco; Giovanni da Milano, Andrea di Cione called Orcagna (1308–1368), and Nardo his brother (died 1365); Agnolo Gaddi (died 1396), Antonio Veneziano, Francesco da Volterra (both of these worked in the Campo Santo at

Pisa in the last years of the fourteenth century), and Spinello Aretino (died 1410). Spinello's work may be seen at Arezzo plentifully. At Florence paintings by the Gaddis, Giovanni da Milano, and others are in S. Croce; at S. Maria Novella by Orcagna, Simone di Martino of Siena, and others; at S. Miniato by Spinello Aretino; at Or San Michele, the Bargello and other churches by other members of the school. In the Campo Santo at Pisa are paintings by Pietro di Puccio, Buffalmacco (according to Vasari), Andrea da Firenze, Antonio Veneziano, and Francesco da Volterra, and at S. Francesco in the same city are fine works by Taddeo Gaddi. At Prato and Pistoia, also, as well as at Rome in S. Peter's and S. John Lateran, are compositions for which Giotto and his scholars are answerable. In most of these places one sees repetitions of the same subjects because they were required according to a certain pattern, and the painters supplied the demand, putting in as much beauty and dexterity as they could, and even rendering the emotions and aspirations of the soul with considerable success when the subject lent itself to such expression. They made the mistake of trying to translate metaphors into concrete images, of which Giotto's marriage of S. Francis with Poverty is perhaps the best instance, because he was the most powerful artist of the school.

Simone di Martino was Giotto's great contemporary

Wall-painting by Cimabue in the Upper Church of S. Francesco, Assisi.

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at Siena (1265–1344). His largest work is in the Palazzo Pubblico at Siena, a symmetrical composition of the Madonna surrounded by saints, with a beauty in the form which the Florentines did not reach, an arrangement which was practically repeated some years later by Lippo Memmi in the Palazzo Pubblico at S. Gemignano. He worked from 1339 onwards at Avignon, and many of his frescoes are to be seen in the papal palace there and in the castle of Villeneuve-les-Avignon on the other side of the Rhone. At San Gemignano is a cycle of pictures by Barna da Siena, who was a pupil of Simone di Martino, as were the brothers Lorenzetti (1309–1348). The influence of these latter on Sienese art was so great that in the fifteenth century painters still reproduced some of their compositions. The cycle of frescoes in the Sala della Pace in the Palazzo Pubblico at Siena, representing Good and Bad Government and their results, is said by Burckhardt to be the work of Pietro, but is more usually ascribed to Ambrogio Lorenzetti. In the chapel are paintings by Taddeo di Bartolo, who also painted in S. Francesco at Pisa, and the chapel of the Corporal at Orvieto was painted by a Sienese, Ugolino di Prete Ilario, who also helped to decorate the choir in conjunction with Pietro di Puccio about 1360, but the pictures have been a good deal restored and repainted.

At Padua the chapel of S. Felice in S. Antonio was painted by Altichieri da Zevio and Jacopo d'Avanzo in 1376, and the chapel of S. George was decorated by the same artists in the next year. They are well painted, with considerable beauty in the figures and strength of colour, and a suggestion of aërial perspective appears, which gives a curiously modern feeling to the compositions. At S. Anastasia, Verona, are other paintings of the fourteenth century, some of which are ascribed with some probability to Altichieri.

With the beginning of the fifteenth century a new spirit began to spread over painting. The individual succeeded to the abstract type, and clearness of expression was sought above everything. The study of nature was pursued with enthusiasm, each approach to perfect success in the representation of the human form was regarded as a triumph, and the craftsman began to neglect the total decorative effect of his work in favour of the more complete realisation of the details of which it was composed. Fresco was so much practised by the Tuscans, and their works in this manner so much surpass those of other schools, that it may almost be called their peculiar property. Masaccio's name may be placed at the head of the revolution, though his master Masolino (1383–1440) showed almost as great a feeling for nature in his

frescoes at Castiglione d'Olona near Varese. His best known works are in the Brancacci chapel of the Carmine at Florence, and from them Raffaelle did not disdain to borrow figures; but at S. Clemente in Rome there is a chapel with scenes from the life of S. Catherine, believed to be an early work of his, but by some ascribed to his master Masolino. He died early, at the age of twenty-seven, in 1428. The last exponent of Giotto's technique was the accomplished Dominican painter Fra Angelico (1387–1455). He began his work at S. Marco, Florence, after 1436, and worked there for ten years. In 1447 he was at Orvieto, where he began the vault of the Cappella Nuova, from which he was summoned to Rome to paint the chapel of S. Nicholas in the Vatican, which occupied him between 1450 and his death. He had the rare good fortune to go on improving to the very end of his life, and this chapel is his finest and most mature work. His pupil Benozzo Gozzoli carried his beautiful and detailed technique even farther, and became one of the most accomplished painters of the Renaissance. He was born in 1420 and died after 1497, filling his long life with the production of the most charming wall-paintings, which, if he had had what is often called "soul," would have placed him very near the summit of the Palace of Art. Subject was of little importance to him; he rarely endeavoured

to get at the heart of it, but contented himself with inventing all kinds of ingenious and beautiful surroundings, which make his pictures most interesting from the multiplicity of details of costume and incident of the period in which he lived. He helped Fra Angelico in the ceiling at Orvieto, from 1449 to 1452 or later was painting in the Franciscan church at Montefalco, painted the chapel in the Palazzo Riccardi for Lorenzo de Medici between 1457 and 1463, was at San Gemignano between 1463 and 1467, where he painted a series of subjects from the life of S. Augustine, and from 1469 to 1485 worked in the Campo Santo at Pisa.

Another artist of very definite personality was Fra Filippo Lippi (1406–1469). His best known wall-paintings are the frescoes in the cathedral at Prato, painted in 1456, and the apse of the cathedral of Spoleto of ten years later, where he died, poisoned by the relations of Lucrezia Buti, the nun whom he had persuaded to leave her convent, as report goes. Sandro Botticelli (1447–1510) was his pupil, and carried the representation of inspired ugliness to its height, occasionally retaining the inspiration and letting the ugliness go. His most celebrated frescoes are the fine subjects in the Sistine chapel in the Vatican, subjects from Old and New Testament history and figures of popes, painted between 1480

Painting by Cimabue on the vault of the Upper Church of S. Francesco, Assisi.

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and 1483; but in the church of Ognissanti in Florence is a very remarkable small fresco of S. Augustine. Filippino Lippi, who finished the frescoes in the Brancacci chapel left unfinished by Masaccio, was more a painter of easel pictures than of frescoes.

The most celebrated painter of the school was Domenico Ghirlandajo (1449–1494), whose fresco of S. Jerome forms pendant to Botticelli's S. Augustine in Ognissanti, Florence, a marvellous piece of work in which all the details of the writing materials and surroundings are expressed with the precision of a highly finished water-colour painting. This absolute mastery over the process and the material is also shown in his more important works, of which the series in S. Trinità, Florence, and the fine series in S. Maria Novella, finished in 1490, may be cited as examples. He also painted at S. Gemignano and in the Sistine chapel, where he was working between 1483 and 1485. His life was almost overfull of work, and he may stand as an example of the capable craftsman who knew his art down to the minutest detail, but whose compositions are not often informed with the magic spirit which gives life to the dead paint. Another Florentine painter of this period, who painted in the Sistine chapel, was Cosimo Rosselli.

Piero dei Franceschi (1420–1492) is another of the commanding figures of the time. He was a citizen

of Borgo San Sepolcro, where the house of his family still exists. His earliest fresco extant is the portrait of Sigismond Malatesta kneeling before S. Sigismond his patron saint, in the church of S. Francesco at Rimini, which although a good deal repainted retains enough of the original design to show his feeling for style and close study of nature. His most important work is the series in S. Francesco at Arezzo, describing the legend of the Holy Cross, where great technical skill is displayed and fine drawing of the figure, and in his native town is an admirable Resurrection, preserved in the Palazzo del Comune. Luca Signorelli (1441–1523) was his pupil and inherited his taste for and skill in drawing the figure. His earliest frescoes are at Loreto, he painted in the Sistine chapel in 1482 one of the sections of the history of Moses, and at Monte Oliveto Maggiore, where the first eight of the subjects from the life of S. Benedict in the monastery court are from his hand; but his greatest triumph is the Cappella Nuova, in the cathedral at Orvieto, painted between 1499 and 1505, representing scenes from the Apocalypse. These foreshadowed the greater successes of Michel Angelo in the Sistine chapel.

The Umbrian school takes its rise in Gubbio, where a celebrated miniature painter named Oderisio, mentioned by Dante, lived at the end of the thirteenth

century. Of the Gubbian painters the most celebrated was Ottaviano Nelli, who died in 1444, and painted the chapel in the palace of the Trinci in Foligno about 1424, and other frescoes in his native town. But to most people the Umbrian school means Perugino and Pinturricchio, the former of whom (1446–1524) gains added glory from having been the master of Raffaelle in his boyhood. He was a very accomplished though mannered painter, and works of his in fresco may be seen in the Sistine chapel, where he was painting in 1482 (only one of his frescoes remains, Christ giving the keys to S. Peter, the three which were on the altar wall having been destroyed to make room for Michel Angelo's Last Judgement) in the refectory of the convent of S. Maria Maddalena de' Pazzi in Florence (a very fine Crucifixion in three compartments), and the celebrated frescoes on wall and ceiling in the Sala del Cambio, Perugia (1499). Pinturricchio (1455–1513) may be also seen in the Sistine chapel and in several of the churches at Rome, such as Araceli and S. Maria del Popolo. In 1501 he painted the chapel of the Sacrament in the cathedral at Spello with three excellent frescoes, and also decorated the vault, and in 1505 commenced his most celebrated work, the frescoes in the Piccolomini library at Siena, finished in tempera, ten subjects from the life of Æneas Sylvius Piccolomini,

who became pope as Pius II., which are in the most extraordinary state of preservation and look almost as if painted yesterday. They were finished in 1507.

At Bologna one sees the work of another group of artists of this period—Lorenzo Costa (1460–1535), Aspertini, and others who worked with Francesco Francia (1450–1517). A chapel in S. Giacomo Maggiore belonging to the Bentivogli family contains some good paintings in tempera on canvas, affixed to the wall, by Lorenzo Costa, and frescoes above by unknown artists; but the more celebrated oratory of S. Cecilia adjacent, erected in 1481, is a little museum of frescoes by Francia, Costa, and their pupils. The extraordinary talent of Andrea Mantegna (1430–1506) is best seen in Padua and Mantua, his most mature works in the Vatican having been destroyed to make room for the Cortile del Belvedere. His frescoes are almost like tempera pictures enlarged, and his passion for the antique sometimes misled him into taking archæology for art; but his great power is indubitable, as is the influence which he exerted upon many of the painters of the period. The Eremitani church at Padua contains the histories of S. James and S. Christopher, not entirely by his hand, and in the ducal palace at Mantua is the Camera degli Sposi, decorated most delightfully with subjects from the family history of the Gonzagas.

Wall-painting by Giotto in the Upper Church of S. Francesco, Assisi.

THE INFANT CHRIST AWAKES IN S. FRANCIS'S ARMS AS HE IS CONSTRUCTING A "PRESEPE" FOR THE CHRISTMAS FESTIVAL.

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Vincenzo Foppa of Brescia (1457–1492) occupied in Milan the same position which Mantegna had at Padua and Mantua. Frescoes of his are to be seen in Michelozzo's chapel of S. Peter Martyr in S. Eustorgio, where the coloured decoration is ascribed to him though unsigned. Borgognone, who was painting between 1486 and 1523, is another distinguished artist of the Lombard school. He executed excellent frescoes at the Certosa at Pavia, and there are paintings of his in several of the churches of Milan. Boccaccio Boccacino's beautiful and decorative frescoes in the cathedral at Cremona must not be passed over (about 1500), in which he was assisted by his son Camillo and others. At Naples, in a court of the convent of S. Severino, is a series of twenty frescoes, ascribed to Zingaro (whom the Neapolitans consider to be the father of their school), representing the life of S. Benedict, considered to be the best series in existence except those at Monte Oliveto.

To return to Florence. Fra Bartolommeo (1475–1517) painted frescoes in S. Maria Nuova and S. Marco; from 1500 to 1506 he did no painting, having become a monk in consequence of the death of his friend Savonarola, and given up the practice of his art. He was assisted generally by Mariotto Albertinelli, his fellow-pupil under Cosimo Rosselli. Andrea del Sarto (1486-1531), called the faultless painter, was assistant

to Piero di Cosimo for some years, but it is Fra Bartolommeo's influence which is most strongly seen in his frescoes. He is considered the finest colourist of his school in the sixteenth century, but lacked the true fire —his successes are always technical. The frescoes in the Atrium of the Annunziata are all excellent as compositions, but the only one which rises to pure beauty is the Birth of the Virgin. In the Last Supper in the refectory of S. Salvi he almost challenges comparison with Leonardo, however, and in the court of the Scalzo his monochromes of the life of S. John Baptist are of great power.

The work of Michel Angelo (1475–1563) is too well known to need description. It is the culminating point of Renaissance painting, and the super-human ceiling of the Sistine chapel has been the admiration of art lovers for centuries. The Last Judgement in the same chapel was painted between 1534 and 1541, and errs by lack of ideality and gradation of type. With his followers decadence more than begins.

Raffaelle (1483–1520) began painting in the Vatican in 1509, and between that time and 1511 decorated the Camera della Segnatura, which contains the Disputa del Sacramento, the School of Athens, the Parnassus and Canon Law, Prudence, Temperance, and Courage in the lunette, and on the vault, Poetry, the Judgement of Solomon, Marsyas, and the Temptation

of Eve. In 1512 he commenced the next room, called the Stanza of Heliodorus from the fresco of the chasing of Heliodorus from the temple. It also contains the Mass of Bolsena, Attila and Leo the Great, and the Deliverance of S. Peter, finished in 1514. The room of the "Incendio del Borgo" contains very little if anything from Raffaelle's own hand, and Perugino's beautiful circular subjects still remain on the ceiling. In the Sala di Costantino the great fresco was designed and the cartoons made by Raffaelle, as were several of the single figures. Carlo Maratta did a great deal of restoration here. The painting was principally done by Giulio Romano. The loggie were executed by his pupils from his designs. Other frescoes of his or from his designs are in the churches of S. Maria della Pace, and S. Maria del Popolo, and in the Villa Farnesina, where is the beautiful fresco of Galatea and the story of Psyche, the latter painted by Giulio Romano and others from his designs. Giulio Romano (1492–1546) was his most important pupil. He settled in Mantua, where he designed the Palazzo del Tè for Duke Frederick Gonzaga, and painted in the ducal palace. In a room of the former are some life-size portraits of horses of a wonderfully modern appearance. The other pupils of Raffaelle are of little importance except Perino del Vaga, who did a good deal of external painting on palaces at Rome and Genoa, and Andrea

Sabattini, who painted at Naples and preserved something of Raffaelle's feeling.

Leonardo da Vinci's only wall-painting, the Last Supper, is such a wreck, owing partly of its having been painted in oil and partly to subsequent repaintings, that the influence he exercised over his pupils and followers is perhaps a better way of judging his eminence than by reference to a work of which only the excellent composition remains. The most eminent of them were Bernardino Luini, Cesare da Sesto, Giovanni Antonio Boltraffio, Marco da Oggiono, Andrea Salaino, Giovanni Pedrini, Sodoma and Gaudenzio Ferrari. In S. Maurizio, Milan, called the Monastero Maggiore, a church which is divided into nuns' choir and public church, the frescoes on the dividing wall are by Luini, while in the nuns' choir, which is decorated in charming taste and pretty fully painted, he was assisted by Boltraffio and Borgognone. Other frescoes are in the picture-galleries of the Brera; but his most important works are at Saronno (1525), where Gaudenzio Ferrari, Lanini, and Cesare da Sesto also worked, and at Lugano, where on the piers and in the chapels of S. Maria degli Angeli, and on the high wall above the chancel arch, are very celebrated frescoes. The large fresco, which contains several hundred figures, represents the Passion of Christ, and is probably his masterpiece (1529). Gaudenzio Ferrari

Wall-painting by Taddeo Gaddi. Lower Church of S. Francesco, Assisi.

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(1484–1549) worked at Milan, Novara, the Sacro Monte of Varallo, at Saronno as before mentioned, and at Vercelli. His pictures show great power and naturalism but little interest. Giovanni Antonio Bazzi, called "Il Sodoma," was born at Vercelli in 1477. He was an unequal painter, but possessed of great talent and sometimes succeeded so well as to challenge comparison with the greatest names. His beautiful S. Sebastian in the Uffizi at Florence has never been surpassed. This is in oil, but his frescoes at Monte Oliveto are many of them of great excellence, and other frescoes of his may be seen at S. Domenico Siena (in the chapel of S. Catherine), and in the Palazzo Pubblico of that city, in which he established himself in 1501. He died in 1549.

Antonio Allegri, called Correggio (1494–1534), was the discoverer of the scenic light and shade which finally destroyed the sense of style in Italian decoration. From a technical point of view he may be said to represent the final development of Italian oil painting. He aimed at absolute realism and the annihilation of the surface upon which the painting was executed, and often attained considerable success, the arrangement of the composition being purely picturesque and aërial perspective being used to assist the illusion. He settled at Parma in 1518, and there may be seen perhaps the most charming of his works in

fresco, the Camera di S. Paolo in the abolished Benedictine convent, children peeping through oval openings in a trellis of greenery, painted in that year. The cupola of the cathedral was painted between 1526 and 1530, and there are several other frescoes of his in the city executed between 1518 and 1530.

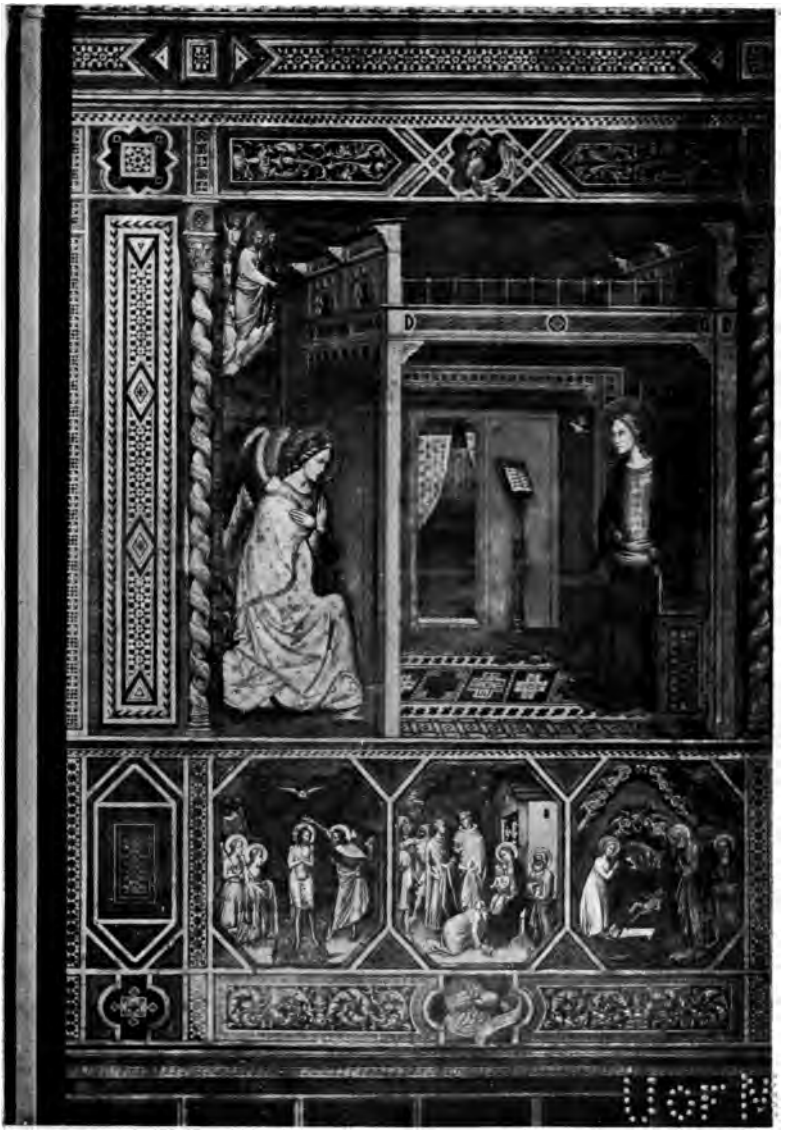
The earlier Venetians worked very little in fresco, and though there are remains in Venice of Giorgione's work and some fragments ascribed to Titian, whose frescoes in the Scuola del Santo and Scuola del Carmine at Padua are much admired, the names of Venetian fresco painters are most of them of later date. Giovanni Antonio Pordenone (1483–1539) painted at Castel Colalto, Villanuova, Treviso, and other places, and there are some remains of his work in the cloister of S. Stefano, Venice. Girolamo Romanino of Brescia (1485–1566) painted in the cathedral at Cremona and in the bishop's palace at Trent, and to him are ascribed some of the frescoes in Colleoni's castle of Malpaga. But Paolo Veronese (1528–1586) in his frescoes at Castelfranco, at Villa Fanzolo, and other places near, and at the Villa Barbara at Maser especially, equals in decorative effect the best masters. Here variety of subject—mythological scenes on the ceiling alternating with allegorical figures and mountain landscapes on the walls, and balustrades arranged as friezes, on which well-dressed Venetians of both sexes lean—

makes a very pleasant decoration, and the excellent preservation of the pictures enables one to gain a good idea of the surroundings amid which the Venetian patrician enjoyed his country life.

The masters of the decadence are scarcely worth attention; their enormous works are generally uninteresting, nor is there much to be learnt from their mannered technique. The Caracci and their pupils aimed at an eclecticism which should unite the merits of all schools (even those contradictory to each other) founded on naturalism, and Domenichino and Guido Reni did sometimes produce works which were really fine, such as the well-known Aurora by the latter in the Rospigliosi palace at Rome; but dexterity of manipulation and cleverness of drawing have supplanted the fine style and dignified treatment of the best periods in most cases. Tiepolo the Venetian (died 1770) is an instance of this great dexterity, coupled with considerable feeling for picturesque composition, but Luca Giordano, called "Fa presto" because he was so rapid (1632–1705), surpassed him in this direction. His compositions show considerable feeling for colour, and at Naples may be seen frescoes which he finished in two or three days. Armenino, in his *True Precepts for Painting*, gives a curious account of the dexterity of Luca Cambiasi, one of the later Genoese painters, who must have

surpassed even Luca Giordano in rapidity, one would think: "A certain Luchetto of Genoa, who painted in S. Matteo some histories of the saint in competition with another painter of Bergamo, a very worthy man. . . . I saw wonderful things of his; he painted with both hands, holding a brushful of colour in each, and he was very expert and determined and did his work with incredible rapidity." Modern naturalism, in the strict sense of the word, took its rise with Caravaggio (1569–1609), who was followed by Ribera (1588–1656), but these men principally painted in oil, and in their easel pictures the exaggerated light and shade and black shadows are not so unpleasing as they would be in fresco.

This rapid sketch concerns itself with wall-painting only. Many of the names included are those of painters who also painted many easel or panel pictures, but with these we are not now concerned, and I have not considered the great oil pictures which one sees in Venice affixed to wall or ceiling, though these were often painted for their place, because, notwithstanding their frequent individual beauty, they do not in general decorate the wall-surface, being either too dark or too shiny, and, as is shown by those which have been removed to picture-galleries, looking quite as well among accidental surroundings. Still, it is



Wall-painting of the fourteenth century in S. Maria Novella, Florence.

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Mail

with a certain remorse that one leaves out such pictures as Carpaccio's series in S. Giorgio degli Schiavoni, Venice, and the Ursula series in the Academy, while the ceilings of the ducal palace and a few of the wall canvases are equally deserving of admiration, though they were not wall-paintings in the sense in which the word is used in this book.

The power of representing natural facts increased with extraordinary rapidity together with the facility with which materials were handled, and the aim of representing nature contended with traditional treatment and vanquished it. Giotto died in 1337. The roof of the Sistine chapel was painted by Michel Angelo between 1508 and 1512, and Raffaelle died in 1520, by which time the decadence had set in. In this two hundred years the art of fresco painting burgeoned, culminated, and began to decay. The level of attainment was, however, most varied in different parts of the country, and when one remembers that Fiorenzo di Lorenzo of Perugia died in the same year as Raffaelle, who was also trained in Perugia, and that Masaccio and Gentile da Fabriano were living at the same time, it seems impossible to devise any general arrangement which shall show continuous progression and elucidate the divergences and attractions of the different schools between and for each other.

THE PREPARATION OF THE WALL

SOME of the various processes of wall-painting lay more stress upon the preparation of the wall than do others. The most modern methods attach the greatest possible importance to this matter, sometimes, indeed, appearing to consider the permanence of the painting more important than its quality; while others rely upon interposing an impermeable layer between the wall and the painting, and thus neutralising any damage which might result from dampness or efflorescence; and there can be no doubt that, other things being equal, it is better to have a perfectly constructed wall upon which to apply decoration, especially in a climate which has not the dryness of Egypt nor the brilliant sun of other southern lands. But even in Italy and Greece the greatest care was prescribed in the construction of such walls, and was often taken, with what excellent results recent discoveries at Cnossus have shown us, where wall-paintings executed some 3,600 years ago still showed bright and vivid colouring when disinterred from the earth which had shrouded them for many centuries.

The preparation of the wall according to the Greek method as given by Vitruvius was as follows. The first process was called *trullisatio* (for they knew nothing of damp courses), and consisted in coating the wall with trowelled plaster composed of rough sand, pounded brick and tile, and lime, in the proportion of one part lime, two parts river sand, and one part pounded brick or tile, which was left rough. The second process was called *arenatum* or sand mortar. Not less than three successive coats of this were laid over the rough plaster, each laid while the preceding coat was damp. The more substantial the mortar was, the more durable and solid the stucco turned out. The proportions were: one part lime and two parts river sand. The third process was called *marmoratum* or marble mortar. This consisted of lime and marble dust of different degrees of fineness, laid on in three successive coats, using the coarsest first. It was so tempered that when in the right condition it did not adhere to the trowel in working, but left it clean. The first and second coats were allowed to dry before the third was put on. It consisted of one part lime and two parts marble dust. It was sometimes done with less expenditure of time and material (for there were jerry builders even in those days), but it was found that if only one layer of *arenatum* and one of *marmoratum* were put on over the *trullisatio*, the

colours did not show with their proper brilliancy, and the plaster was likely to crack and the whole decay after a time. When done well and thoroughly the surface of the stucco was so smooth that it might be polished, and it was sometimes used for mirrors. In the baths of Titus the stucco was one and a quarter inch thick, and was as hard as marble.

In modern times the Italians use three kinds of stucco, the first called *pozzolano*, which consists of two parts lime and one of pozzolana, or Roman cement; the second *marmorato*, made of two parts lime and one of marble dust; and the third *arenato*, made of two parts lime and one river sand. Signor Forni, however, calls the first plaster *arricciato* and plasters generally *smalto*. The rough plaster was always made of pozzolana, lime, and sand. The lime for the plastering is made from limestone or marble. It should be slaked long before being used, so that parts not sufficiently calcined may have time to be dissolved, and be reduced to a proper consistency; for should the lime be fresh, or not thoroughly slaked, it will "blow," that is, emit pustules and destroy the surface of the stucco.* The Greeks tempered their

* A story comes to my mind told to me by the late G. T. Robinson, a man whose knowledge was encyclopædic and his experience immense. When a young man he was studying in the Campo Santo at Pisa, and made the acquaintance of an artist who was engaged in repairing the frescoes in that building, who promised him to tell him the secret of

arenatum in a pit, the lime and sand being compounded with wooden rammers until thoroughly amalgamated, and the same method was adopted with the *trullisatio.* To ascertain when it is fit for use cut it with an axe; if it comes in contact with lumps, the lime is not well tempered; if the iron comes out dry and clean, it is perishing and weak, but when fat and well macerated it will adhere to the iron like glue. River sand only must be used. Pit sand causes fermentation in conjunction with lime, sea sand is salt and the salt dissolves the plastering. Pozzolana is a red earth found at Puteoli and a strong cement. Roman cement is an imitation of it. The marble dust is chippings of marble sifted into three grades of coarseness, the first being a very fine powder and the last almost like small pebbles.

The plaster is better if laid some years before, but if the wall which it is proposed to decorate is covered with old mortar the ingredients of which are unknown

compounding the intonaco used by the mediæval painters. Accordingly on the last day of his stay he led him across the piazza to his house and showed him in the undercroft, exposed to the air, but sheltered from wet, three casks containing slaked lime. Tapping the first, he said, "My grandfather: unfortunately very little of him left"; tapping the second, "My father: I shall soon have to commence him"; and tapping the third, "Myself: this is what I am preparing for my children." This shows how not only traditional knowledge and receipts are handed down from father to son in a land where tradition is not yet dead, but the very materials with which the work is done, and reveals the true secret of its permanence.

it should be entirely removed. The Germans use for their roughcast three parts of sand to one of lime. At Munich the lime was slaked in this manner. A pit was filled with clean burnt lime stones, which on being slaked were stirred continually till the substance was of an impalpable consistence. The surface having settled to a level, clean river sand was spread over it to the depth of a foot or more, so as to exclude the air, and lastly the whole was covered with earth. The German painters preferred it to remain thus for three years, and Cornelius prepared the lime for the Ludwig Kirche eight years before he painted there. The pits were simply dug in the earth, but Professor Hess recommended them to be lined with brick. At Genoa the lime is left in the pit for from eight to twelve months, according to its ascertained strength.

Vitruvius gives the following directions for the preparation of a curved ceiling. Parallel ribs are to be set up not more than two feet apart; cypress is preferable, since fir is soon injured by rot and age. When the ribs have been got out to the right curve they should be fixed to the ties of the flooring above or to the roof with iron nails. The ties should be of wood not liable to injury from rot, age, or damp —such as box, juniper, olive, heart of oak, cypress, and the like, common oak always excepted, which from its liability to warp causes cracks in the work.

By Nicolò di Pietro Gerini. In the Sacristy, Santa Croce, Florence.

CHRIST BEARING THE CROSS.

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Main

The ribs having been fixed, Greek reeds previously bruised were to be tied to them with cords made of Spanish broom. On the upper side of the arch a composition of lime and sand was to be laid, so that if any water fell from the floor above, or from the roof it might not penetrate. The arches having been prepared and interwoven with the reeds a coat was laid on the underside. The *arenatum* was afterwards introduced on it and it was then polished with chalk or marble. Paolo Veronese's frescoes at the Villa Maser were painted on cored ceilings made in much this manner. The ribs were of deal, with poplar laths, three inches by one inch, plastered above as well as below, as in the French framed ceilings, such as those at Versailles. Sometimes in Italy the upper portions of brick vaults were plastered, as in the Palazzo del Giardino at Parma. On damp walls an inner wall is advised by Vitruvius, with an air space or channels in the wall; if there is not room for this the rough coats should be made with pounded potsherds. Wiegmann says that the layers of mortar should be rubbed with a wooden rubber to remove the crystals which may form, that the wall should be always damp upon which the layers are applied; if four are used they should not be thicker than m. 0·018, if only one or two they should be at least m. 0·027. The last coat of sand-mortar having become

solid enough, finer mortar or stucco is applied, composed of calcareous spar and pounded marble. This spar is more often found in the ancient plasters than marble powder, though the Romans called this stucco *marmoratum*, but they called both by the same name. Of this plaster two or three coats are put on, gradually getting thinner and finer, the first m. 0·008, the second and third m. 0·004 to m. 0·002 thick. As soon as the consistency of these layers allows of it, they are to be beaten in every direction, which makes them more solid; afterwards the surface is smoothed with a flat polished stone, taking care to keep it wet. Often one only finds two coats of marble, or even one, often the colour is borne on a coat of fine sand, lime, and broken terra-cotta. The thickness also varies, the medium thickness being m. 0·07. The ancient thickness is always greater than the modern. At S. Médard-des-Prés the coat of coarse sand and lime is m. 0·021 thick, covered with a second coat of finer mortar m. 0·004 thick, and a stucco on which the artist worked. The stucco of the pillars of the loggie is only m. 0·003. The thick ground keeps moist longer, and the painter could work for five or six hours without stopping On thicker layers which would keep damp still longer, thicker coats of colour could be applied, such as coloured mortars. According to the monk Denys, the

Greek painters of the Middle Ages mixed straw with the lower coat and cotton-fibre with the upper. The stucco, by the beating of the *baculi* (an implement which appears to have survived to the present day in Ischia), became so close and fine in texture as in some cases to resemble marble. Vitruvius says "That which is well covered with plaster and stucco closely laid on, when well polished, not only shines but reflects to the spectators the images falling on it." "Some persons, cutting slabs of plaster from the ancient walls, use them for tables; and the pieces of plaster so cut out for tables and *mirrors* are of themselves very beautiful in appearance." Although at the time of the Renaissance and in the modern revival of fresco the smooth surface with which the plaster was finished, as suggested in these extracts, was not approved by the painters, the remains of Roman wall-painting which have come down to us are almost universally executed upon such a surface and have lasted well for the most part, though that may be partly owing to the wax varnish which appears to have been used to preserve the colours. A smooth surface takes longer to harden than a rough one. Sometimes it was roughened by rolling a linen cloth over it, which also made the texture even, and obliterated the marks of the trowel. Leo Battista Alberti says that nails were fastened into the wall to keep

the coats of plaster on, and that bronze was better for this purpose than iron, but that he himself preferred the practice of inserting thin pieces of flint projecting edgewise from the joints of the stone, driven in with a wooden mallet. When the frescoes in the Vatican were examined by Cavaliere Agricola in the forties he found that the Heliodorus had suffered from a flue behind it—the plaster projected in some places nearly four inches from the wall! It had been secured with nails and the cracks filled in with some composition in 1702 by Carlo Maratta. One cannot help thinking that Leo Alberti's flint nails would have been of service here.

The German manner of preparing the surface for painting is as follows. The surface is wetted with boiled or rain water till it ceases to absorb. Then a thin coat of plaster is spread over the part to be painted, rather rough. As soon as it begins to set (ten minutes or so, according to the season), a second thin coat is laid: somewhat "fatter" lime and sand in equal proportions. These two layers together are scarcely a quarter of an inch thick. A wooden trowel is used, and if the surface is required quite smooth some beaver nap is fastened to the trowel, or a dry brush is passed over the plaster in all directions. At Genoa the preparation of the intonaco is very careful. The lime is taken out of the pit with a

Fresco by Taddeo Bartoli in the Chapel of the Palazzo Pubblico, Siena.

THE DEATH OF THE VIRGIN.

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spade from the centre, and is mixed with water in a trough with a sluice at the end till as thick as milk; it then passes through the sluice and a fine hair sieve into earthenware jars, filling them two-thirds full. When the water on the surface is clear it is poured off. After there is no more to pour off the lime is of the consistency of white paint and as smooth. It is now mixed—two parts of sand to one of lime, great care being taken to have the sand even, sharp, and not too dark in colour. Professor Hess said that if the plaster contains too much lime it becomes incrusted too soon, is too smooth on the surface, and easily cracks. If it contains too little it is not easily floated and the plaster is not so lasting. A glass float should be used where a wooden one is unfit. The surface of the last coat should be slightly roughened to render it fit for painting on. "The wall thus prepared should be left for a quarter or half hour before beginning to paint." Professor Church says that the lime-putty prepared for the frescoes at the Houses of Parliament was of excellent quality, so that their failure cannot be ascribed to bad material. He also recommends the wall being well wetted with lime- or baryta-water before the plastering is commenced, and says that it should be dry, free from soluble saline matters, and not very porous, and should have a damp course. He

gives a receipt for a fresh kind of plaster which he says he has found good. "Three parts of burnt lime in very fine powder are ground up with two parts of whitening or prepared chalk; the mixture is grouted and then strained through hair sieves; five parts of the putty thus obtained are mixed with five parts of sifted, crushed marble, or with five parts of sharp, fine, sifted sand, or with three parts of sifted pumice, or with the same quantity of infusorial (siliceous) earth; the whole being moistened with a sufficient quantity of lime-water to render working easy. For the undercoats the sand may be coarser, and a small quantity of the most silky and white asbestos, cut with scissors into short uniform lengths, will prove a desirable addition, lessening the risk of lack of continuity in the undercoats." In small works a smoother surface is required, and it may be polished by putting a sheet of paper on it and passing the trowel or the palm of the hand over it, which presses the roughnesses into the body of the plaster.

FRESCO PAINTING

THE permanency of paintings executed "a fresco" depends upon the action of the carbonic acid in the atmosphere, which converts the lime of the mortar into carbonate of lime. The carbonic acid is driven out of the limestone or chalk by the process of burning, and when slaked the remaining lime is converted into a pulp of hydrate of lime. In this form it exists in the mortar and greedily absorbs the water with which the colours are applied. This water, with that already in the mortar, dissolves a portion of the hydrate of lime, and after a time this solution finds its way through the supervening layer of colour to the surface, where it absorbs carbonic acid gas from the atmosphere. It thus becomes carbonate of lime, and lies upon the surface in a thin crystallic film, protecting and securing it, so that it may be washed if not rubbed hard. Experiment has shown that the colour does not sink far into the surface. The pigment becomes saturated with the solution of hydrate of lime, which can only become carbonate of lime

on the surface, and if this surface be removed by scraping or dissolved away by an acid, or in some other way, the pigment gives way readily if rubbed with the finger, and still more with moisture. Frescoes sometimes peel off in flakes. This is caused by the different layers having been superposed at a sufficient interval for the crystallic film to have been allowed to form between them, though if the work is sufficiently rapid and well-judged for the layers not to interfere with each other, but at the same time to become equally saturated with the solution of lime a real process of cohesion takes place. The Rev. J. A. Rivington commenced his paper on Keim's process at the Society of Arts in 1884 with this excellent account of the chemistry of the fresco process, and I thought I could not do better than reproduce it here. Professor Church says that in air contaminated with the products of combustion of coal and gas true fresco soon perishes. "The carbonate of lime is converted into the sulphate, breaking up the paint and becoming itself disintegrated in the process of change. And the layer of paint itself may scale off from the production of sulphate of magnesia from the carbonate of magnesia in the plaster. . . . If more binding material be required it may be introduced by means of lime-water, or even of baryta-water, which contains twenty times

as much hydrate of baryta as the strongest lime-water contains hydrate of lime. In some plasters and with some pigments silicate of lime is produced, a more permanent binding material than the carbonate."

In this chemical union of pigment and lime the number of colours which can be used is necessarily limited, since all vegetable and animal pigments must be excluded, as they will be altered by caustic lime, and some even of the mineral colours, leaving for the most part only colours which are dull in tint. But this limitation of number and brilliancy is distinctly advantageous from the point of view of decoration, since it is almost impossible to produce a garish colour effect with them. The painters of the Renaissance produced any bright colours they desired by glazing with tempera after the work was dry, but any retouching is liable either to go black or perish in some other way, especially if exposed to weather or bad air. The medium employed by Munich artists for such retouching was vinegar and white of egg, and crayons made of pounded egg-shells and red chalk have also been used. The colours are chiefly simple earths, though there is said to be a method of rendering vermilion durable. The Munich list is as follows: WHITE—lime which has been kept a long time. YELLOW—all kinds of ochres and raw sienna. REDS—all kinds of burnt ochres, burnt sienna, oxides

of iron, and lake-coloured burnt vitriol. BROWNS—umber raw and burnt, and burnt terre verte. BLACK—burnt cologne earth. PURPLES—burnt vitriol, cobalt blue and lake-coloured burnt vitriol. GREENS—verona green (terre verte), cobalt green, and chrome green. BLUES—ultramarine, cobalt, and factitious ultramarine (the last does not always mix well). Mr. Armitage gives a much more restricted palette. "Lime takes the place of white lead. The only yellow it is safe to use, at least in England, is raw sienna; probably, however, Mars yellow, which is derived from iron, might be used with safety. Light red of various kinds and burnt sienna are the principal reds. Oxide of chromium is the green. Raw and burnt umber are quite safe, as is also black. Blue is a difficult colour to use, and it is almost impossible to paint a blue sky properly gradated. Lakes and vegetable colours are to be strictly avoided." Paillot de Montabert says: "The earths employed should be marbles and stones as far as possible, so as to make a sort of coloured mortar when well ground." P. Pozzo says that Roman vitriol calcined in the oven is a good colour for fresco; tempered with brandy it makes a red purple very useful for sketching in drapery intended to be finished in vermilion. These two colours mixed make a colour as sparkling as the finest lake. The "light red of England," which, I

Portion of the Great Crucifixion by Fra Angelico in the Chapter-House of S. Marco, Florence.

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suppose, means Indian red, is said to give almost the same colour as the vitriol, acquiring its proper colour as it dries. The receipt for preparing vermilion is quoted from M. Watelet: "Put it in powder into an earthen jar and throw on it lime-water taken at the moment of effervescence from quicklime thrown into it. Use the cleanest and clearest. Pour off this lime-water without stirring up the vermilion, and repeat the process several times. The vermilion should be purchased in lumps, since in powder it is often adulterated. . . . Burnt yellow ochre gives a pale red, and has the same good qualities as in its raw state. Mixed with the black earth of Venice it may be used for the shadows of carnations and for those of yellow draperies. Red chalk may also be employed. Umber is principally useful for the shadows of yellow draperies. Burnt it is excellent for strong shadows of carnations mixed with black earth of Venice. Enamel powder blues stand air and rain very well. They must be laid while the plaster is very fresh, and a second coat in an hour increases their brightness. It is strong enough for ordinary shadows; for strong shadows charcoal black should be added. Ultramarine is excellent, *but too dear for frequent use.* Of green terre verte of Verona is the best. Pozzo even says that it is the only one which can be used, the others being affected by lime. The black earth of Rome

resembles that of Venice, and is generally used for black draperies. Black of charcoal and burnt wine lees may also be employed." Latilla, who was a member of the Society of British Artists, gives the following list, which scarcely agrees in all its details with his statement made just before, "that mineral, animal, and vegetable substances are destroyed quickly by the action of the lime." WHITE—calcined marble or stone lime. YELLOWS—Naples yellow, yellow ochre, Roman ochre, brown ochre, raw sienna, and burnt sienna (!). REDS—Chinese vermilion, light red, Indian red, burnt copperas. BROWNS—raw umber, burnt umber, Vandyke brown, Cologne earth. GREEN—terre verte. BLUES—ultramarine, ultramarine ash, French ultramarine, cobalt, royal smalt. BLACKS—ivory black and charcoal. He says that smalts of various colours, as used for glass painting, are valuable (enamel colours apparently), and gives certain mixtures which he had found useful, such as—"For flesh tints use light red and lime, or vermilion and white. For high lights, burnt sienna, varied with Naples yellow or raw sienna. For greys, ultramarine ash and white. Black, Indian red, burnt sienna and white (mixed) make good shadows for flesh, as does also raw umber, when the subject is very large. Burnt umber possesses great depth in fresco, and is an excellent colour for the darker shadows. Draperies, if painted in black and white,

may frequently have the lights glazed, which gives a fine effect."

When the plaster has been properly prepared for the painter and has been left for a short time to become sufficiently firm, the outline is traced and he begins to work. The surface should be wet enough to receive the impression of the finger, but not so wet as to be stirred up by the brush. If it dries too fast it must be sprinkled. The first tints sink in, and to get the full effect the surface has to be gone over several times. But if it be not occasionally moistened it is found that the upper colour does not unite with that underneath. Great attention to the preparation of tints on the palette is necessary, for if mixed in small quantities as the work proceeds they will appear streaky when dry. Rain-water (which has not passed through an iron pipe) boiled or distilled water must be used. After the painter has laid in his general colour he should wait half an hour or longer, according as the colour sets, before proceeding to more delicate modelling. In the first operations warm or powerful tints should be avoided, as these can be added with better effect as the work advances. After the second painting and another pause the work is finished with thin glazings and washings. If the touches of the brush remain wet on the surface, and are no longer sucked in instantaneously, the painter must cease to work, for the colour no

longer unites with the plaster, and the touches will show as chalky spots. As this moment approaches the absorbing power increases, the wet brush is sucked dry by mere contact with the wall and the operation of painting becomes more difficult. A letter from a Mr. A. Wilson, written in 1843, describes the process used by Genoese painters in fresco at that time. The artist had two pots, one of lime, and one of pale flesh colour. On a large slate table he had terre verte, smalt, vermilion, yellow ochre, Roman ochre, darker ochre, Venetian red, umber, burnt umber, and black, rather stiff, about one or two ounces of each ground in water. Near him lay a lump of umber; he tried his colours on this, which instantly absorbed the water. He was painting a head of the Virgin, and began with a pale yellow for the glory, then laid in head and neck with pale flesh colour, and the masses of drapery round the head and shoulders with a middle tint, with brown and black in the shadows. Next with terre verte he modelled in the features, while he also put in the cool tints of the face with pale umber and white, using the same tint for the hair and the folds of the white veil. All these colours were quite thin; he touched the intonaco tenderly and allowed ten minutes to elapse before touching the same place a second time. He now worked from his coloured study, modelling the features, putting colour in the cheeks and mouth, and

Fresco by Benozzo Gozzoli in the Chapel of the Palazzo Riccardi, Florence.

ADORING ANGELS.

shading the hair and drapery, deepening always with the same colours. Having worked for half an hour he halted for ten minutes while he mixed darker tints, and then began finishing, loading the lights and using the colours much stiffer; he also softened with a brush dipped in water. Another rest of ten minutes; but he had nearly finished the head and shoulders now and only had to put in some light touches in the hair, heighten the lights generally, touch in the darks and throw a little white into the halo round the head. He had done this in about an hour and a half with four rests to allow the wet to be absorbed into the plaster. The Munich men have an expedient to arrest the drying if the painter has to be absent for some time. A board is padded on one side, the cushion being covered with waxed cloth; a wet piece of fine linen is then spread over the fresh plaster and painting and pressed against the surface of the wall by the cushioned board buttressed by a pole from the ground. But any such expedient must be of slight utility, since, as has been said, fresco does not depend for its durability upon the thorough drying of the plaster, but upon the crystallisation of the carbonate of lime on the surface of the wall, forming "a fine transparent enamel which the colouring matter thoroughly penetrates, invests, and becomes itself so fixed." The failures which attended some of the earlier attempts at reviving the art of

fresco painting in England were partly due to the painters not realising the necessity of using freshly made plaster nor of ceasing to work when crystallisation had commenced on the surface. Paillot de Montabert also lays stress on the necessity for strengthening the tints by going over them again with touches of the same colour to correct the weakening which takes place on their absorption into the lime. He says retouching may be done by hatching the first painting over with a stronger tint in harmony with that below. "These hatchings freely made are softened by the intervening air and united to the general effect. Tints may be softened into each other directly after being applied either with soft wet brushes or with the fingers, a process used most in heads and extremities, especially when the plaster has been allowed to harden by leaving it a little too long."

When the day's work is done the superfluous plaster is cut away, and care must be taken to make the joins at the edges of forms so that they may not attract attention. The next day the surface of the plaster already painted has to be wetted, especially at the edges, which must be done with a brush; so that it is best to begin at the top of the painting, if possible, and thus avoid soiling from the water running down over the work already completed. The changes undergone by fresco in drying are rather alarming to the inex-

perienced painter; within two or three months various changes succeed each other till the picture almost entirely disappears. Michel Angelo was so much upset by these changes that he went to the pope and asked to be allowed to resign the work on the Sistine ceiling. He was referred to San Gallo, who explained the matter to him.

Latilla's instructions as to the sequence of processes are interesting as showing how such things were done in his time. "In beginning large mural decorations the first step is to paint in all the ornament, it being easier to harmonise subject to ornament than ornament to subject; and arabesques form an excellent key for the tone and colour of the historical painter. This part completed, it is a good plan to fix the blank cartoons in their respective situations, and then sketch in the general design, as a better judgement of it can be formed when up." This must mean that spaces were left for the figure compositions, the rest of the wall, or ceiling, being covered with a more or less architectural framing of ornament. "When all the cartoons are painted with egg tempera, they should again be placed on the panels, when the full effect of the whole will be seen, which is especially necessary when different hands are employed. Alterations and improvements can then be suggested and the various cartoons harmonised to suit each other." This is a

practice advocated by Mr. Armitage also, and one has no difficulty in realising the advantage of employing it. "If possible, have the cartoon placed *in situ*, so that the size of the figures, the arrangement of the groups, and the general effect may be judged. Nothing which requires alteration should be left knowingly. Simplicity cannot be too much observed in the colouring as well as the design." Latilla goes on: "When the plan is fully arranged, and the panels prepared to all but the last layer of stucco by the plasterer, the painter may commence thus: a portion of the cartoon must be cut out, and the back of the outline blackened with charcoal, laid upon the piece of fresh plaster; a point having been passed over the outline, an impression will remain on the stucco (or it may be pounced)." "Semi-opaque tints scumbled over solid colour become very brilliant, the high lights should then be touched on. The whole should be kept low in tone, as the colour dries considerably lighter. Over the first layer of colour the touches are almost invisible for some seconds. Dark colours, if used first with white, should be glazed purely afterwards. Water sprinkled with a long soft brush on the stucco occasionally will prevent its getting dry too soon. Flesh should be painted at one time, drapery at another, and always so as to avoid seams in the lights, and where it would be difficult to unite the next part. Backgrounds, particu-

In the apse of the Cathedral, Spoleto; Fra Filippo Lippi's last work.

CORONATION OF THE VIRGIN.

larly skies of a large size, must be painted by two or three persons, the superintending artist directing and harmonising." Paillot de Montabert says of backgrounds that care must be taken to prepare enough colour for the whole surface, as the matching of tints is extremely difficult. Mr. Armitage says "Paint from the *shadows* to the *lights*. At the end of the day, when the surface is becoming too dry for solid painting, thin washes of colour may be used. The Italian 'terra rossa,' burnt sienna, raw sienna, and even vermilion may be of great service for glazings." He also describes another mode of painting in true fresco, in which the colours are used transparently throughout, and which he says, as far as his experience went, was more durable than the solid method. In this very fluid lime was floated over the intonaco as soon as it was sufficiently set, and after an interval of ten minutes another coat was given. "This smooths the surface. Pounce the outline. You have no palette, but half a dozen small tumblers. In one mix raw umber and oxide of chromium with water. Make two weaker tints from this in two other pots. This replaces the old terre verte. (Modern terre verte will not stand the action of lime.) Model your head from dark to light. Then take three clean tumblers and make tints of light red or terra rossa, adding raw sienna for a bronzed complexion, and tint over the completed

modelling. Then with a small brush and burnt sienna or burnt sienna and umber strengthen the darkest parts, such as nostrils, division of the lips, etc., and add black for eyebrows or eyelashes if required. There are none of those capricious changes to fear in this process, which constantly occur when lime is used as pigment."

In the time of Cennini a shaded monochrome was first painted. The flesh and the hair were outlined with sinopia (light red) on the rough plaster, and then the thin lime surface plaster spread, only covering as much as could be painted in a day. It was made as smooth as possible by what would now be called water-polish. A strong outline was then painted on the white surface with "verdaccio," which was made of black, dark ochre, light red, and white. Then the shadows were put in with terre verte and flesh colour in three tints of light red and white carefully added over the underpainting. "With the darkest tint go to the edge of the shadows, but always taking care at the contours that the terra verde should not lose its value." "Verdaccio" was also used for underpainting draperies, buildings, and other parts, and sometimes the terre verte was used over the flesh tint. Care was taken to lay every tint in its right place, so that only a little softening and blending was required to complete the effect.

The brushes should be of hoghair, either flat or round, but with long hair so as not to disturb the surface of the plaster, and a few brushes made of otter hair may be used for small touches; no other hair will resist the action of the lime. The palette should be either of porcelain or of tin, in the latter case it may be protected from rust by a light-coloured varnish. Latilla recommends the use of earthenware cups to hold the colours. If the palette is of tin it should have a rim round it to prevent the colours from running off.

The preparation of the cartoon is a matter of great importance, since everything must be settled on it. Cornelius, the great German fresco painter, used to prepare his upon a frame covered with strong cloth upon which paper was glued. A second layer was glued over this when dry, the sheets being scraped a little at the places where they overlapped. The surface was then prepared with size and alum and the drawing made with charcoal. It was fixed by wetting the cloth at the back and steaming the drawing in front, which melted the size a little and thus fixed the charcoal. A tracing was made from this cartoon and either pounced or traced on the wet wall. Latilla says the cartoon should be painted with the same colours as the fresco, and if opaquely it will be better imitated by the assistants. He advises the

use of colours ground in water and a medium of yolk of egg. He mentions that white will work pleasantly and in an impasto if mixed with parchment size and a little drying oil and used with yolk of egg—a form of tempera. He also says: "Beat up a little pale drying oil with the white and yolk of an egg; it makes an excellent medium and the colours do not change when it is used. It will receive high finish and may be employed either opaquely or semi-transparently."

One of the drawbacks to the use of fresco is that the rough surface harbours dirt and is very difficult to clean without damaging the crystallic film. Professor Church gives the following directions for cleaning a dirty and damaged fresco: "Methylated spirits of wine applied freely on tufts of carded cotton removes the tarry and sooty impurities which a previous careful brushing of the painted surface has failed to dislodge. Attempts to clear the clouded portions by means of distilled water are not usually successful. The films which obscure the surface sometimes consist of sulphate of lime, etc. In getting rid of this somewhat opaque film by means of water portions of the pigment are generally removed. When a fresco has been dusted and then cleansed with spirits of wine it should be allowed to dry thoroughly and then treated with the paraffin copal medium, largely diluted with spirits

Fresco by Filippino Lippi in the Brancacci Chapel of the Church of the Carmine, Florence.

THE DELIVERANCE OF S. PETER FROM PRISON.

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Mapu

of turpentine or pure toluene. The matt surface is thus preserved, the obscuring films are rendered transparent, and if another cleaning is ever needed the surface may be safely sponged with pure water or weak spirits of wine."

Signor Forni, in his manual for the picture restorer, gives the following as the result of his experience and of traditional methods of cleaning frescoes: "In case of mould or efflorescence, get the wall as dry as possible, wash it gently with a damp sponge dipped in very dilute ammonia, and leave it for three or four months. If the mould returns do it again. If this does not succeed there is no remedy. If it succeeds, and more complete cleaning is required, use stale bread or skim milk, lupin flower mixed with water, white vinegar, white wine, lime-water, or a weak solution of tartaric acid. Good results may sometimes be obtained by the use of distilled vinegar, sour lemons, and salt water. If the blackening comes from smoke, especially if of an oily nature, pure ammonia is better, or a decoction made from saponaria root; then essence of soap, Greek wine (used by Carlo Maratta in the Vatican), sulphuric acid, but weak, onion, urine, or cooked potatoes, washing the painting with a sponge dipped in distilled water and drying with white cloths, soft and clean. Retouchings may be recognised by being more opaque when looked at against the light, and special care must

be taken where they occur—if they begin to move the colour will show on the cotton. Blue was always put over a red fresco preparation "a secco," and so were some of the greens, but yellows, reds, purples, mixed tones, brown, and black are almost always without retouchings. Varnishes are almost impossible to remove satisfactorily."

There are certain drawbacks to the employment of fresco which may be noted here. At a meeting of the Society of Arts on February 12th, 1864, when the subject under discussion was the best method of painting to employ in mural decoration, at which a paper was read by J. B. Atkinson highly extolling fresco, Lord Elcho, who was in the chair, quoting J. R. Herbert, R.A., said that if the plasterer on one day put more water into his plaster than he did on another the colour would come out different though the same colours had been employed. In the fresco of Lear and Cordelia he had cut out the head of Lear six times and that of Cordelia five times, and there was no part of that picture which had not been cut out four times. Mr. Dyce's and Mr. Herbert's plasterers both died mad—in Mr. Herbert's opinion, owing to constant worry. Paillot de Montabert cautions the painter in these words: "The artist who is careful of his health will not commence his work until the plaster is quite dry, especially

if in a closed place or one sheltered from wind. A dangerous dampness is exhaled from it, and a fetid odour from the lime which affects the chest and the brain. A painter ought also to examine carefully the scaffold made for him. The mason often prefers to risk his life to taking the care required to make the scaffold absolutely firm; the artist ought not to be so rash. . . . For this mode of painting there is no to-morrow in which to reconsider. The day's task has to be done without turning back. The only way of making alterations is to cut the plaster out and start afresh."

As has been said, the practice in Italy at the end of the fifteenth and beginning of the sixteenth centuries was to retouch the fresco when dry with tempera colours and to obtain those brighter colours in this manner which fresco would not give. Pinturricchio, for instance, in the contract for the Piccolomini library at Siena, agreed to paint the heads in fresco and finish them in tempera. Careless cleaning or natural decay has often removed these "ritocchi" or caused them to turn black. Taylor, in his manual for fresco and encaustic painting, describes a medium which he says is very good for retouching which sounds as if it might be permanent. It is made of "caseum" from fresh cheese. The cheese is to be triturated and worked with warm water till all the soluble part is carried off

by the washing. "Use a sieve or coarse linen cloth, through which it is finally pressed to deprive it completely of the water. The residuum will crumble like stale bread. It may be dried on unsized paper. This material is not soluble in water except by adding quicklime; by triturating this mixture it becomes a very viscous sort of cream, which can be diluted with water—dries quickly and cannot again be dissolved." It may be kept mixed with lime in a stoppered bottle, and when required ground with a muller and warm water.

Fresco secco differs from buon fresco in that it is not painted upon wet plaster. The same colours are used, and it is claimed by some that it is as durable as real fresco, and will bear being washed quite as well. The plastering having been completed, and lime and sand only used for the last coat, the whole is allowed to dry thoroughly. It is then rubbed with pumice stone, and the evening before the painting is to be commenced the surface must be well wetted with water in which a little lime has been mixed. The next morning the surface is again moistened and the cartoons fastened up so that the outline may be pounced. The colours are mixed with water only as in buon fresco. If the wall becomes too dry it is moistened by sprinkling, or with a fine syringe. The process is ancient and is described by Theophilus. With Cennini the word

Portion of fresco by Botticelli in the Sistine Chapel, Rome.

THE HISTORY OF MOSES.

"secco" generally means tempera. Professor Church says the fixation of the pigments is less complete. Peter of S. Audemar gives the medium for "secco" as either egg or gum, confusing it with tempera as Cennini does.

The most modern opinion is that up to the time of Giotto tempera only was used, but that his practice was to begin with fresco, finishing and adding small details in "secco," and that true fresco did not become common until the end of the fourteenth century.

The most accessible modern frescoes are (for the Englishman) Sir E. J. Poynter's Martyrdom of S. Stephen in S. Stephen's Church, Dulwich; Mr. Watts's fresco of the Lawgivers in the hall at Lincoln's Inn; Mr. Dyce's figures of Apostles, etc., on the east wall of All Saints', Margaret Street; Mr. Armitage's frescoes in the church of S. John, Duncan Terrace, Islington; and those by various artists in the corridors of the Houses of Parliament and in the House of Lords. A very successful series was painted by Mr. Dyce in the King's Robing-Room—subjects from the *Morte d'Arthur*, illustrating the knightly virtues of "Courtesy" (Sir Tristram harping to La Belle Isoude), "Religion" (the vision of Sir Galahad and his company), "Generosity" (King Arthur unhorsed spared by Sir Lancelot), "Hospitality" (the admission of Sir Tristram to the Round Table), and "Mercy" (Sir Gawaine sworn to be

merciful and never to be against ladies). They are in very fair preservation except for efflorescence and scaling here and there, mostly in the less successful subjects fortunately. The most successful are the "Religion" over the fireplace, an excellent piece of design and painting, and the "Hospitality" opposite the windows. The skies throughout are very luminous, and the restriction in the number of possible colours scarcely felt at all, the absence of brilliant reds and yellows being rather an advantage than otherwise, and the blues have been lowered very scientifically. A few of the heads have become black in the endeavour to give more relief by modelling, especially in "Courtesy" and "Mercy." The darks of the hair in the background figures in "Hospitality" might be lighter with advantage, thus giving a slight prominence to the foreground figures in accordance with the difference in size.

Sir Edward Poynter's fresco of S. Stephen is nearly in a perfect state. The frescoes at All Saints', Margaret Street, were cleaned and retouched by Mr. Armitage a good many years ago.

TEMPERA

THE word "tempera" is used for a glutinous medium which binds colours and is soluble in water, such as size, gums, or egg; and in a more restricted sense for a vehicle in which yolk of egg is the principal ingredient. The analysis of fragments of coloured plasters from ancient buildings shows that a form of tempera was the usual manner of applying the colours to wall surfaces. In Egypt wax was found together with substances coming from animal blood and glue; at Athens, wax, odoriferous gums, and substances thought to be vegetable. In Sicily yellow organic matters were found in considerable quantities mixed with a little of a fat substance and lime. At Pompeii there were found: (1) Organic matters in less quantity than in Sicily, and containing portions of fat substances and lime, with traces of silica, aluminum, magnesia, and sometimes chlorate of sodium; (2) Animal matters, supposed to be milk, mixed with lime.

In the Middle Ages yolk of egg diluted with fig juice, which was used for painting, was also used medicinally.

For wall-painting warm size was sometimes used, the distemper colour of the present day. A fifteenth-century MS. in the public library at Strassburg, quoted by Eastlake, gives a receipt for making size which would keep and not smell—very useful, since stale size does not dry well. It was made from parchment cuttings like the gilder's size of the present day, but vinegar was to be added after it was made and the whole well boiled again. (Mrs. Herringham, however, says that boiling size diminishes its tenacity.) When it was used equal quantities of size and water were taken, honey was added, and the whole warmed. Professor Church says that in selecting a size the special purpose for which it is to be used must be considered, and whether one which is insoluble in cold water and strongly gelatinising or one which is partially soluble and very adhesive would be best. "The former is less liable to crack when dry than the latter. The very fine gelatins used in photography will often be found suitable. As caustic lime, caustic soda, chloride of lime, sulphurous acid, and certain mineral acids are frequently employed in their manufacture, they must be tested. A hot-water solution must not redden blue litmus paper, nor bleach dahlia paper, nor embrown turmeric paper."

In using a size medium care must be taken that the ground has no grease in it: the colour when mixed

Detail from Botticelli's fresco of the life of Moses, in the Sistine Chapel, Rome.

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Mau

should drop from the brush in a thread, the size being used warm.

Glutinous vehicles were diluted with wine for a long time in Italy; the northern artists were content to use beer. Honey was added to retard the drying of the colours. As long ago as the latter half of the thirteenth century it was the English practice to varnish tempera pictures; and the numerous black Madonnas revered in various churches show that such varnishing was usual still earlier, the darkness of tone being usually the result of the darkening of the varnish. In dry climates egg-tempera attains a firm consistency and withstands ordinary solvents. It sets rather than dries, and to be solid must be painted directly and left undisturbed. Tempera was used for retouching frescoes "a secco," adding details which would have taken too long to put in at the time that the main painting was done, and also for painting on the dry wall as well as on panel and cloth fastened to wall or panel. Sometimes the medium used was the whole egg diluted with fig juice, which acted as a solvent and also contained a small amount of india-rubber. If the yolk should become too thick to use it may be diluted by the addition of a small quantity of water, being well mixed by shaking. Cennino recommends two temperas for finishing buon fresco, the first that just mentioned and the second yolk of

egg only, and "you must know that it (the latter) is of universal application—on walls, on panels, or on iron, and you cannot use too much of it." In chapters lxxii. and xc. he directs the artist to check the over-absorbency of the wall with a diluted wash of egg before commencing to paint. He mentions seven to ten coats of colour, so that it is evident that it was the custom to paint with thin coats of colour, and without using impasto. It was usual to make an under-painting in green, called "verdaccio," then to glaze transparent colours over the shadows and mix white with the same tint for the lights.

The yolk of egg medium does not protect the colours from deterioration with absolute completeness, but answers well enough for most purposes; and the best fifteenth-century pictures are still in a state of pre-preservation which may almost be called perfect. Professor Church says that "yolk and white of egg, like other nitrogenous bodies, are susceptible of coagulation, and thus may become a substance which is virtually leather. This may be effected by treating them with a solution containing tannin. Egg yolk being one-third oily or fatty matter is really well on the way to be an oil medium. As it dries the oil hardens and remains intimately commingled with the albuminous substances left behind on the evaporation of the water present. These albuminous substances

coagulate and become insoluble in the lapse of time—a change greatly accelerated by the old practice of exposing the finished tempera picture to the sun."

He gives the following analysis:—

	Yolk.		White.
Water . . .	51·5	...	84·8
Albumen, vitellin, etc. . .	15·0	...	12·0
Fat or oil . . .	30·0	...	0·5
Mineral matter . .	1·4	...	1·2
Other substances . .	2·1	...	1·5

and says that temporary preservation from putrefaction may be effected by means of a lump of camphor or a few drops of eugenol (from oil of cloves). "A saturated solution of eugenol in five per cent. acetic acid is made, and this is added, drop by drop, with constant agitation, to the yolks in a wide-mouthed bottle, the change of colour in a slip of turmeric paper giving the stopping point, when this paper just regains its original colour, which was turned brownish red by the yolks. Water may now be added and a lump of camphor." He lays great stress on the correction of the alkaline reaction of the yolks, returning to the subject again; this time he recommends the addition of a few drops of white vinegar. White of egg needs dilution with water, thorough shaking and filtering through muslin. Used alone it dries too hard for painting with, has very little body, and after

a time has more tendency to crack than when mixed with the yolk. The media serve not only to bind the pigments to the ground, but also the coloured particles to each other. Lead and copper paints are now excluded from the tempera palette, so that the sulphur in the egg does not alter any of the colours.

At the beginning of the fifteenth century tempera painting on cloth was common in the Netherlands; Van Mander says that at that time rooms were frequently hung with such works instead of tapestry. The mediums employed were egg and size. Eastlake asserts that the priority of records is in favour of an English invention of the vehicle, both for transparent and more solid tempera, that which was used in the Netherlands being different from that employed in Italy, and that according to Sandrart the ordinary tempera was found not to last, owing to the size being affected by the damp climate. For the same reason, no doubt, the transparent method described in Le Bègue's copy of the MS. of Alcherius was adopted both in England and in Germany, in the former country certainly during the fourteenth century. Eastlake gives it thus: "In England the painters work with these water colours on closely woven linen saturated with gum water. This, when dry, is stretched on the floor over coarse woollen and frieze cloths, and the artists, walking over the linen with

Fresco by Domenico Ghirlandajo, in the Church of S. Maria Novella, Florence.

THE BIRTH OF THE VIRGIN.

clean feet, proceed to design and colour historical figures and other subjects. And because the linen is laid quite flat on the woollen cloths the water colours do not flow and spread, but remain where they are placed, the moisture sinking through into the woollen cloths beneath, which absorb it. In like manner the outlines of the brush remain defined, for the gum in the linen prevents the spreading of such lines. Yet after this linen is painted its thinness is no more obstructed than if it was not painted at all, as the colours have no body."

In England walls which were to have figure subjects painted on them appear often to have been prepared with cloth glued over the surface, an expedient also adopted sometimes in Italy; and Sandrart says, "as they feared the walls might crack, they glued linen over them, then laid a ground of gypsum and painted their pictures in tempera." Damp was of course a great enemy, and many were the expedients resorted to to keep it at arm's length. Tinfoil was sometimes used for this purpose. Vasari says "walls, when dry, should receive one or two coats of warm size, the work being then executed entirely with colours tempered with it." The followers of Giotto used to combine fresco and tempera in their work far more than merely in retouching. They used to sketch in the composition on the rough plaster to try the effect, and then the

intonaco was laid over it, either in pieces or altogether, according as tempera or fresco was intended to preponderate in the completed work. (See the section on fresco secco.)

Ornaments in relief, such as nimbi and diapers (to be afterwards gilded), were formed with "gesso sottile" (made with one gallon of water to one pound of plaster), to which was added enough Armenian bole to give it a little colour. Ornaments thick enough to cast were fastened to the walls with ship pitch. Small reliefs were also made with "vernice liquida" (sandarac varnish) and flour, and with two parts of wax and one of pitch used warm.

In tempera, when the binding matter, the gluten, is too plentiful, the colours dry on contact with the air and the painting cracks and scales off: from this arises the necessity of applying them in thin coats and letting them dry well before retouching. The process was much used by the Egyptians. Whether wood or cloth were the ground the first coat of colour was always white, the white underpainting making the colours of the other coats more brilliant. Egypt produces mimosas which give gum, and gelatine glue was known there, but, according to Mérimée, its painters preferred a tough gum like gum tragacanth. There are few signs of cracking in their paintings, and some think that they used honey to mix with the gum. The

colours were applied with brushes made from the fibres of the reed, larger brushes were doubtless made of the arak (*Salvadoro persica*) say Cros and Henry. These brushes and palettes of wood, alabaster, or enamelled pottery are to be seen in museums. Sometimes they have as many as twelve hollows in them, but seven is a more usual number, the colours employed being white, yellow, green, blue, red, dark brown, and black. They used varnishes with which they "glazed," and these are sometimes still transparent and colourless, though others of a resinous basis have darkened. The Greeks and Romans also used gum and glue as a medium. Vitruvius writes of the preparation of lamp black. "One takes a part, which tempered with gum serves for writing ink, the rest mixed with glue may be used for painting walls." They used principally "sarcocolla," a resinous gum from a shrub of North Africa, transparent and soluble in water, "very useful for painters and doctors." Pliny says the best glue is made from the ears and genitals of bulls. "Glue of Rhodes is that which deceives the least, so doctors and painters use it." "Those who paint by putting a coat of sandyx (fire colour) and of purpurissimum (violet carmine) with egg (which shows that the egg medium was then known) obtain the brightness of minium. If they wish to make purple they put upon a coat of blue, purpurissimum with egg." This is evidently a pro-

cess of glazing. They also used milk as a medium. The earth of Chios dissolved in milk was used, according to Pliny, for rewhitening walls. At Elis there was a temple of Athene in which Panænus, brother of Pheidias, covered the plaster with milk and saffron, which, Pliny says, could be smelt when rubbed with a wet hand. Vitruvius says that by mixing vaccinium (our myrtle) in a certain manner with milk a fine purple was made.

The brushes used by the Greeks and Romans were made from the tail of the ox in the most ancient times, but Vitruvius mentions hog hairs. The sponge was also used and sometimes by way of a brush; Pliny says "there is a sort of close, fine sponge, from which brushes are made." All sorts of grounds were used. M. Chevreul analysed some coloured stucco from the temple of Jupiter at Agrigentum and from an ancient temple at Selinunt, and found considerable quantities of organic matter. In two Roman fragments found at the Palais de Justice, Paris, in 1848, he found none, and thought the colours had been used with a medium of lime milk. Some fragments from S. Médard-des-Prés showed neither gum, resin, oil, gelatine, nor cheese. M. Chevreul thought these were done with a medium of hydrated lime mixed with the colours and sufficient water to make it fluid, which is probably the true explanation. The plasters used by the ancients were:

Detail from Ghirlandajo's fresco of the Birth of the Virgin, in S. Maria Novella, Florence.
PORTRAIT OF LUCREZIA TORNABUONI.

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in Egypt, chalk mixed with serum and blood; in Etruria, lime; in Sicily, lime mixed with chlorites of sodium and calcium, silica and ferruginous aluminum. Professor Church says that for tempera (and fresco secco) the wall must be quite dry and completely carbonated, as otherwise the alkaline nature of the ground would limit the colours which could be used. Many Greek and Byzantine paintings were executed upon a caustic lime ground, natural earths being the principal colours used, which are not affected by alkalies. Slaked lime mixed with chopped straw, flax or cotton formed the basis of the plaster, all liable to decay and discolour the ground. The ordinary Italian and Spanish tempera ground consisted either of whitening and size, or of burnt gypsum, stirred well with water, so as to lose the power of setting, strained, and mixed with size. Great care was taken in the washing. The best size was made from parchment or the finer kinds of fish glue. The ground should always be absorbent; the use of too much size makes it crack. Whatever medium was employed the ground was always sized before commencing to paint.

At the time that some mural painting of the thirteenth century was discovered in the Sainte Chapelle at Paris an analysis was made of the colours by MM. Dumas and Persoz. The result showed that the whites were probably a preparation of lead, perhaps

flake white; the drapery blues were phosphate of iron, probably native, and the other blues were ultramarine; the bright red with which the aureole round the angel's head was painted was vermilion, the browns and yellows were ochres; the greens were made with these ochres mixed with phosphate of iron, and the roses and violets were probably obtained from shell fish by a simple mechanical preparation.*

* The question of the Tyrian purple was investigated in 1859 by Lacaze-Duthiers. He found that when the matter which becomes purple is taken from the murex it is white or slightly yellow, sometimes slightly grey. (It is a little band on the lower face of the mantle between the intestine and the gills.) Submitted to the action of the sun it becomes first citron yellow, then greenish yellow, then green, and then turns to violet which becomes darker and darker. At the appearance of the violet a penetrating smell of essence of garlic is given off. By varying the quantity of the material and the length of exposure to the sun, drawings may be made of vigorous tone and delicate broken tints. Lacaze-Duthiers made photographs with it which Cros and Henry say were quite successful. The matter is soluble in water and alcohol before being influenced by the light, but when it has become violet it is perfectly insoluble. "If you wish to have a fine colour," says Pliny, "for 50 lbs. of wool mix 200 lbs. of buccin to 111 lbs. of purple, in this way this superb amethystine colour is obtained." Purple also meant a red colour. "During my youth," says Cornelius Nepos, as reported by Pliny, "violet purple was the fashion, and was sold at 100 denari the lb. (about 237 francs the kilo) soon after the red purple of Tarentum, and afterwards the *dibapha* of Tyre, of which the lb. cost more than 1000 denari." Pliny distinguishes between purple and "conchylienne" colour, "for each the matter is the same only for the latter 'buccin' is not used, also they pour into the decoction of purple urine and water in equal parts, and then add half as much purple again. It is by means of an incomplete saturation that this delicate colour so much praised is obtained, so much the brighter as the wool has taken less dye."

Paillot de Montabert says that he found the use of egg yolk only gave much force and unctuousness to the colours; that the mixture of the white with the yolk gave tenacity and greater transparency; while the white used alone gave still stronger and more lively colours, but less soft and more friable. Resins may be added to the yolk, rendering it still more tenacious, harder, and therefore less permeable, and the volatile oil of wax can also be added to this gluten to delay its drying. He says "the process is very rich and splendid, and as powerful as oil." Yolk of egg can be bleached by exposure to light when thinned with spirits of wine. White of egg may be kept in a dry state to be liquefied as required.

He also gives very full directions for painting in distemper. The palette should be of tin, with a piece of leather round the hole through which the thumb goes, to prevent it from galling the flesh. The other end should have a raised edge and several hollows to hold the colours, which should be ground in water only. The size must be kept liquid by being put over some warm coals. "If it gets solid on the palette it may be melted by warming. Take care that the colours do not get dry at the same time, and thin the size if necessary." At the end of each day the palette should be washed and dried to preserve it from rust. When working on a large scale the tints must be mixed in

pots, and the palette becomes much too large to handle; it then stands on a box by the painter. The most important point is the keeping the surface of the cloth, wood, or wall on which the painting is being executed damp. Walls must be perfectly dry in their structure or the colours will fade in drying, and they will crack. If the wall is prepared with lime, lime must be used in the painting, which then becomes *fresco secco*. If it is intended to use chalk whites the wall must be prepared with chalk or plaster white in very thin coats. The plaster must be as good and even as possible; when thoroughly dry give it one or two coats of very hot size, stronger than that which is to be used with the colours. If it is rather uneven, mix a little whiting or chalk with the size to make it more even, or even plaster which has been exposed to the air and well ground. When this is dry the surface is to be scraped as uniformly as possible. The design is then drawn on the surface with charcoal quite lightly, and when the arrangement is settled the outline is gone over with a small brush and very pale colour. The colours should be tried on plaster squares, or on panels prepared in the same way as the wall, or on a warm tile, chalk, or umber, all of which absorb the moisture immediately and show what the colours will be like when dry at once. Tints which look the same when wet are often quite different when

By Domenico Ghirlandajo, in the Church of Ognissanti, Florence.

S. JEROME IN HIS STUDY.

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Not

dry. Keep the pots of colour warm, and stir them up each time you put the brush in them, as the colours are apt to sink to the bottom. Use the colours strong and bright, remembering that they lose half their strength and more in drying. So that one need never fear heaviness, but rather weakness and too great greyness. Remember, too, that burnt earths change less than other colours, and that lake and black change scarcely at all. The brushes should be very soft—those made of goats' hair are good for uniting the colours.

Before beginning to paint, damp the wall till it absorbs no more water; the dampness affords time to unite the colours and give suavity and freshness to the distemper. Begin with the *pale* tones and work downwards to the half-tones and the browns. Distemper requires a decided and single painting. It can be retouched, but the same colours must be employed, otherwise muddiness will result from the mixing of a different over- and under-colour. Tints may be united at once with a brush dipped in pure water. Glazing may sometimes be used, but a light hand and a very soft brush are required, with great rapidity of execution. Before attempting it, pass a wash of size over the place. Sometimes the touches will not "take," the ground being too much charged with size. Then mix ox-gall with fresh colour. If

you wish to retouch after the colour has dried you must moisten the place with your finger and saliva; every other way makes a patch. The effect of retouching is that the added touches stand out disagreeably like a coarse mosaic. The best way is to place the fresh tints when the painting is half dry so that the upper touches may not drag up the lower tint. De Montabert also says: "The rapidity of drying may be lessened by adding viscous juices to the medium, such as those from the bark of mistletoe, the roots of viburnum, the juice of elder, narcissus roots, or other bulbous plants, or snail slime; fig juice has always been employed for this purpose. Sugar, honey, or syrups of marsh mallow or jujube also will lessen the speed of drying, but they become yellow, and absorb moisture constantly." Egg forms the best medium, and volatile oil of wax might be mixed with the size advantageously. Red draperies may be painted successfully with red lead and glazed with lake; yellow draperies may be glazed with gamboge. Blue draperies may be sketched in red ochre and glazed with blue. The fifteenth-century painters obtained greens by glazing yellow over ultramarine, examples of which may be seen at S. Croce in Gerusalemme at Rome. The colours which cannot be employed are vermilion and brown-pinks. Washing over with weak size, however carefully and lightly

done, always reduces brilliancy, but if gold is to be added it has to be done. The mordant is then put on; it is thick glue with a little honey added. The hatchings are put on with the point of a brush, with the material in a warm state and pretty thick. When it is firm the gold is applied and allowed to dry for several days. Care must be taken that the preparation does not sink into the colour, which may be discovered by its losing its shine, for then it loses its adhesiveness, and the operation has to be gone through again.

KEIM'S PROCESS FOR WALL-PAINTING

THE failure of the frescoes which were executed in Germany (on external walls particularly) at the time of the revival of fresco painting, of which the north and east sides of the new Pinacothek at Munich showed such deplorable examples, the hail and rain having destroyed the protecting covering of crystallic carbonate of lime and washed away the colour from the wall beneath, induced certain of the German chemists to search for a mode of wall-painting which might defy the elements and show for centuries the creations of the artist just as they left his hand. The intention was laudable, and success appears to have attended the attempt; and although the difficulty occurs to one that if the decoration is in harmony with the building when it is new, and remains unaltered, it will become more and more out of harmony as years go by, and the unprotected portions take on the lovely tints which nothing will give but the lapse of years; while on the other hand, if this is allowed for in

Fresco by Luca Signorelli, in the Cappella Nuova, Orvieto Cathedral.

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the scheme of coloration, the want of harmony between the decoration and its surroundings will strike one at once; it is scarcely to be expected that the artist, who naturally thinks his picture the most important part of the façade, or the chemist, who glories in the success of his devices, will hold the objection of any importance.

The first of these processes was the water-glass or silicate of potash process invented by Dr. Johann N. von Fuchs, who called it stereochromy, and published a pamphlet explanatory of the process, which was translated into English by direction of the Prince Consort, who was always ready to further any effort in connection with art. The best known examples executed in England by this means are Maclise's two large paintings in the Houses of Parliament, and Herbert's "Moses" in the Peers' Robing-Room in the same building. Maclise went over to Germany to make investigations, and it was upon his information that Herbert worked.

The plaster was allowed to become quite dry before being worked on, and the painting was executed with pure distilled water. Maclise said that he painted direct on to the wall from models, sailors, marines, guns, tackle, ropes, blocks, etc., and that the painting was nearly indelible before the operation of fixing, from the colours becoming absorbed. The pigments

used were the same as in fresco painting, except that the lime white was replaced by zinc white. The under coat of plaster was made of two parts sharp sand, two parts fine sand, and one part of slaked lime in fine powder. The upper coat on which the painting was executed was one-tenth to one-eighth of an inch thick, and was made of three parts fine sand and one part slaked lime. The surface of the plaster may be made of any roughness desired—Kaulbach preferred it as rough as a rasp—and the final preparation of the surface is made by sweeping off the loose particles of sand and moistening it with a saturated solution of carbonate of ammonia before commencing to paint. The next day, when the portion painted has dried, the water-glass is sprayed over it with a syringe, though Maclise used to apply it with a large flat water-colour brush. He used it "two parts water and one of the concentrated liquor imported from Berlin" and applied it freely twice. The water-glass was composed of powdered quartz boiled in purified potass or soda, and Dr. Pettenkofer said that the potass solution was to be preferred.

This process showed certain disadvantages which other German chemists set to work to remove, seeking perfect permanency and believing that the only sure guarantee for the permanence of any painting was the thoroughly scientific observance of and adherence

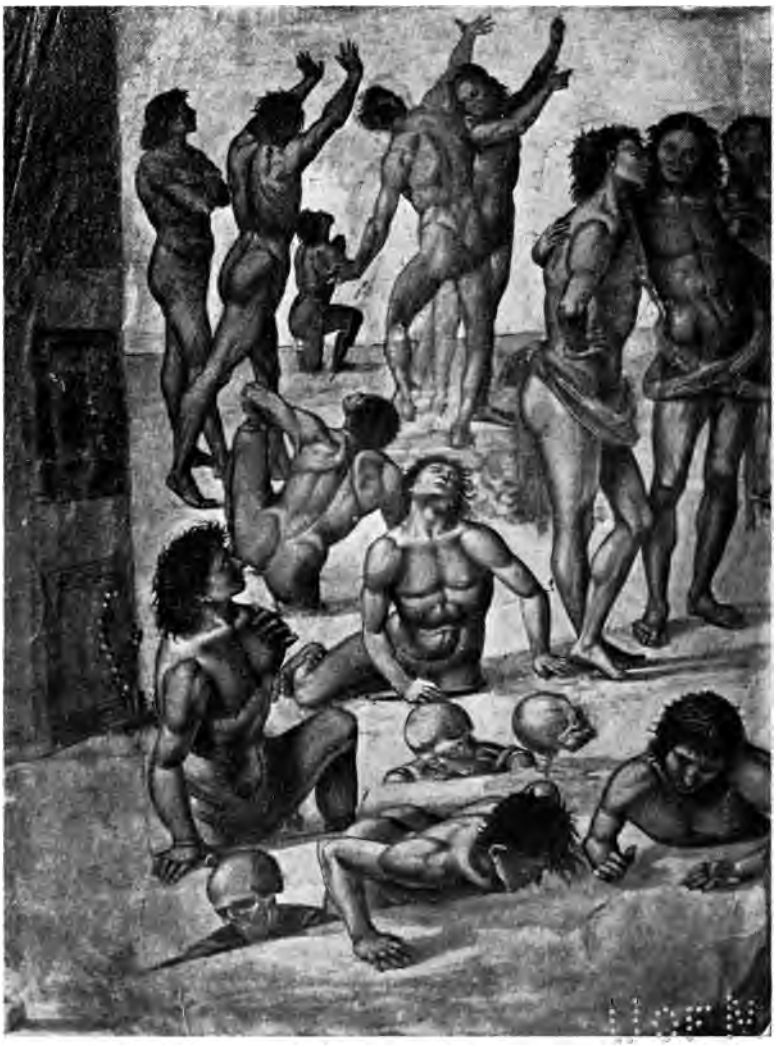
to the laws of chemistry. "Unless the painting is executed under conditions which can be proved to comply with the demands of chemical laws, its permanence is a mere matter of haphazard experiment and a perfectly open question."

A paper was read by the Rev. J. A. Rivington on October 15th, 1884, at the Society of Arts, upon the process as improved by Herr Adolf Keim, and a description is given in Professor Church's *Chemistry of Paints and Painting*; while the late Sir Roberts-Austen, C.B., also read a paper on the latest development of the process as used by Mrs. Lea Merritt in Mr. Harrison Townsend's pretty little church at Wonersh, near Guildford, on December 6th, 1895,* and from these various authoritative sources the following account is put together.

The preparation of the wall is a most elaborate and tedious process. Any damp bricks, over-burnt bricks, or decaying wood must be cut out of the wall and replaced with sound material. If there is any stucco already upon it it must be cleared off and the joints raked out to about the depth of three-quarters of an inch. Upon this surface a thin squirting is cast, composed of coarse quartz sand, infusorial earth, and powdered marble, four parts of this mixture to one part of

* My thanks are due to the Council of the Society of Arts for kindly permitting me to make use of the papers referred to.

quicklime slaked with distilled water. The object of this is to insure adhesion to the wall. Then follows a coat of mortar of ordinary consistency to fill up all inequalities. This is made, according to Sir Roberts-Austen, of pure lime, which has been slaked for some years, one part, four parts washed and dried sand, and one-eighth part of Keim's rough cast extract, the lime being first well stirred in twice its bulk of distilled or filtered rain-water, passed through a fine sieve, and then mixed with the sand. The wall must be carefully dusted and made very wet; when it has sucked in the water, very thin mortar is thrown from the trowel, and before this has quite dried more cast, so as to make the surface quite even. It should not be smoothed with the trowel, but great care must be taken to get the surface even, because otherwise the painting ground cannot be of equal thickness all over, which would affect the fixing of the colours. This mortar must not dry too suddenly or it will crack, and in very dry, hot weather it should be sprinkled with water. If cracks appear they must be carefully filled. When it is dry, which will probably take nearly a year, the painting ground is laid on it. This is composed of the finest white quartz sand, marble sand (artificially prepared and free from dust), marble meal, and calcined fossil meal (infusorial earth). The sand composed of these materials, carefully mixed in proper



Detail from Luca Signorelli's fresco of the Resurrection.
Cappella Nuova, Orvieto Cathedral.

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proportions, is mixed with quicklime slaked with distilled water in the proportion of eight parts of sand to one part slaked lime. It is applied as thin as possible, one-eighth to one-quarter of an inch deep. For work on the exterior of buildings the addition of pumice sand is recommended. Sir Roberts-Austen said that the rough cast must be thoroughly wetted with distilled water, and that if the plasterer rubs it after it is dry the surface will be rotten. The reason for using distilled water is that any admixture of lime would affect the fixing solution. Marble sand (carbonate of calcium in a crystalline form) has been proved by experiment to add greatly to the firmness of the mortar, and the infusorial earth (a form of silica) has a double consolidating effect—first mechanically, cementing and binding together the coarser particles with the lime; second, by forming to some extent with the lime a silicate of calcium, such as afterwards results from the addition of the water-glass.

When this layer has dried for several days—the Rev. J. A. Rivington says when the mortar is perfectly dry down to the brickwork or stone of the wall—a crust of carbonate of lime is formed on the surface, which is removed by an acid supplied by the Munich firm, diluted with three measures of distilled water (hydrofluo silicic acid). This is brushed upon the

walls twice in succession by a slow, regular movement from a large hoghair brush, to open the pores of the wall. It is then allowed to dry for twenty-four hours, after which it may be washed twice with distilled water. The hardening fluid supplied from Munich is then applied diluted with two measures of water. A varnish brush about three inches wide is used for the purpose, and is lightly and evenly drawn over the surface. Drops must not be allowed to run down, and there must be no retouching. This fluid is silicate of potassium. The wall is allowed to dry for twenty-four hours, and the application is repeated. Ceilings may be sprayed, but a glass spraying-can must be used for the acid solution. In places where the ground is uneven it is better to dilute with four measures of water and brush over the surface twice in succession and repeat the process in the same manner. The ground may be rough or smooth according to taste; the smooth is more difficult to fix, as being less perfectly absorbent. It can be made of any tint and can be applied to other materials if it be wished that the decoration should be removable, such as stone, tile, slate, wire gauze, glass, and even canvas, which can be *rolled* with perfect safety. Sir Roberts-Austen says it is, normally, pure white; when struck or scratched it should ring like a stone (and sparks may even be struck from it with steel), if rubbed with the finger no little grains

should be detached, and water thrown on it should be quickly and evenly absorbed. It is then ready for painting on, but may remain for years before receiving colour. Should the presence of any hollow spots be detected by sounding (caused by non-penetration of the fluids) they must be cut out with a sharp knife down to the rough cast and replaced, following the same process. Professor Church says that oxide of zinc may be advantageously substituted for a part of the lime in the intonaco, and it may be added to the pigments. Also that fine asbestos paper, wetted with lime-water and firmly pressed by rolling into a soft freshly laid lime and sand plaster, makes an excellent ground for stereochrome painting; but as a single breadth only can be used, the size of a painting on such a ground is limited. It is most important that the wall should be thoroughly dry and the materials used quite pure. In order to learn whether a wall surface is dry, Professor Church recommends the gelatin test. "Hold a piece of coloured sheet gelatin closely against the wall by a stick pressed against the centre. If the wall be moister than the air the sheet will curl outwards."

The colours used are treated beforehand with alkaline solutions (of potash or ammonia), to anticipate any change of hue from the alkaline liquids which form the fixative. In addition to this they are prepared with

other substances, such as oxide of zinc, carbonate of baryta, felspar, powdered glass, etc., as required by the peculiar properties of each, to obviate all danger of chemical change taking place. The Rev. J. A. Rivington said that at that time thirty-eight colours had been prepared; four varieties of white, six of ochre, two of sienna, ten of red, two of brown umber, two of Naples yellow, two of ultramarine, five of green, three of black, and cobalt blue. Cadmium was to be added. The whites were "zinc white and baryta white, oxide of zinc and artificial sulphate of barium. The latter is less dense, and useful for lightening colours without much damaging their transparency. The ochres and siennas are combinations of oxy-hydrates of iron, calcium, alumina, magnesia, and silica, the colour is due to their being subjected to the influence of heat for a longer or shorter time. The reds are chiefly oxides. The chrome is a sub-chromate of lead. The umber is oxide of iron and manganese combined with silica. The Naples yellow is a compound of oxide of lead and antimony or antimoniate of lead. The ultramarine is artificial, and consists of silica, alumina and sulphate of sodium. The cobalt is protoxide of cobalt compounded with alumina. The cobalt green is the same material in combination with oxide of zinc. The terre verte is chiefly silicic protoxide of iron, and also contains magnesia, alumina, and potash. The chrome oxide

Roundels from the ceiling of the Collegio del Cambio, Perugia. By Perugino.

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green is oxy-hydrate of chromium. All are equally acted upon by the fixing solution." By the time that Sir Roberts-Austen delivered his paper the number of pigments available had increased to forty-five, and he said that all the colours were clear and bright. The colours which cannot be used with the alkaline fixative, such as vermilion, aureolin, the chromates, cadmiums, and madders, are replaced by red lead, chrome red, and uranium yellow.

The colours are ground in distilled water and are mixed on a tin palette with little wells on its surface. The wall must be kept wet, while being painted on, by spraying. Every variety of treatment is possible, and the process adapts itself to any individual style of painting. The colour may be used either transparently or with impasto, but the thinner the coat of colour the greater is the degree of security which can be obtained by the fixing. The Rev. J. A. Rivington says that the process is " far pleasanter and easier to work in than oil or water colours." It presents as perfect facility for transparent glazing as water colour, and for painting in body colour it even surpasses the capabilities of oil colours in its power of opaque treatment. The delicate tints when laid over darker tones do not darken, but keep their full value perfectly. Professor Roberts-Austen said that to a certain extent alterations might be made by washing out.

When the painting is finished and has been allowed one or two days to dry (in damp weather it is advisable to make use of fire-heat) the fixing takes place. The fluid from Munich is diluted for the first and second applications with two measures of distilled water, and for subsequent applications with three. It is advantageous to warm it by standing in covered vessels in pails of boiling water, as when hot it sets more quickly. It is first applied as spray by an apparatus with bellows; any drops which may run down should be dried up at once with clean blotting-paper. After drying for twenty-four hours it should be applied again more plentfully, and with the apparatus nearer to the wall; let it dry again, and apply the spray again, using the weaker solution. After this it may be applied with a broad paint-brush. The test of perfect fixing is the rubbing of the surface with a white cloth without any soiling being visible. The darker colours may require as many as eight applications of the fixing medium. "Be careful to allow time for drying between each. Over-fixing will produce a grey, shiny spot. A few weeks after the fixing wash the surface with a copious spray of distilled water to remove any slight efflorescence." The Rev. J. A. Rivington thus describes the process of fixing. It "is done with silicate of potash treated with caustic ammonia and caustic potash, further treated with

Roundels from the ceiling of the Collegio del Cambio, Perugia. By Perugino.

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carbonate of ammonia. The effect of this upon silicate of potash is that silica is precipitated in a fine gelatinous form and ammonia set free. This latter volatilises, and carbonate of potash is formed, which is easily removed by washing, after the completion of the fixing. The solution is employed hot, so as to obtain a quicker and more perfect formation of silicate. The effect is that the pure colours are inclosed in silicates, whenever the pigments themselves do not take part in their formation. The action of the fixing solution is to form, in addition to the fresco carbonate of lime, a silicate of calcium, which makes the surface much harder, being as it is, with the carbonate of lime, a constituent of some of the hardest marbles. The finished painting will admit of any acid (except hydrofluoric) being poured over it, and it can be cleaned with caustic potash."

Sir Roberts-Austen thus summarised the chemical composition of the materials used and the actions and reactions of the various processes: "The ground is about equal parts of quartz, sand, and marble dust.* This ground is mixed with eight measures of lime and laid on the wall. The undiluted solution

* Free silica	52·28
Lime	26·96
Carbonic anhydride	20·72
	99·96

of acid contained 2·34 per cent. of acid (H_2SiF_6). The object of the treatment of the surface with this is to destroy the layer of carbonate of lime and form silico-fluoride of calcium, which is not insoluble. Treatment with the soluble silicate follows.* The colours have foreign substances added in some cases to make them fix equally with the silica. The fixing solution (16·50 per cent. of silica) completes the cementing together of the particles of the ground and of the various pigments by forming an alkaline carbonate and double silicates. The cost of materials, acid, hardening fluid, and fixing fluid is about 3*s.* 4*d.* a square metre."

He also drew out the differences between the old process of Von Fuchs and Keim's later process as follows: "Von Fuchs recommended the treatment of the underground with the application of water-glass diluted with twice its bulk of water. Upon this the painting ground was laid one-tenth inch thick of ground marble or dolomite with *not too much* lime. In Maclise's journal it was stated to be one-third. The subsequent treatment, first with phosphoric acid diluted with six times its bulk of water, converted

* Silica	22·03
Potash (K_2O)	8·19
Water	68·92
	99·14

Ceiling-paintings by Perugino, in the Stanza dell' Incendio del Borgo, in the Vatican.

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Mau

the crust of carbonate of lime into phosphate of lime, and then two applications of fixing water-glass, with intervals for drying, made the ground suitable for painting on with water colours. The fixing was then done by spraying with water-glass diluted with half its bulk of water, repeated, with intervals for drying. Keim's improvements were—to restore the original scheme in preparing the wall; in fixing the proportion of lime at one-eighth of the bulk of powder; third, in fixing more gradually and by a more diluted silicate. Von Fuchs found that silica combined more readily with two bases than one, and consequently water-glass became insoluble more quickly when mixed with earths or mineral oxides, forming double or treble silicates. It adheres better to marble and dolomite than to quartz, though a little lime with quartz improved its cementing powers. With gypsum it was not satisfactory."

Canvas of proper texture prepared by soaking in a special solution forms a suitable ground for the colours which are laid on and fixed as in the case of the prepared mortar. The work is equally permanent in character and entirely unaffected by light. It is uninflammable, and can be cleaned without the least injury to the most delicate colours. Professor Church says the commercial solutions of water-glass contain from 28 to 60 per cent. of the alkaline silicates,

and that the preparations made for the use of painters "may be trusted." They should be carefully kept from the air, which contains carbonic acid, and all calcareous matters, such as gypsum, zinc white, etc., banished from their neighbourhood.

The claims which are made of absolute permanence and unalterability for this process make it incumbent upon any artist making use of it to put all the knowledge and feeling which he possesses into his work. By his works he will be judged; there will be no added glamour by the passing of the years, nor can any friend say by way of excuse that there has been deterioration. And this may well give the artist pause before essaying so perfect a process, for fashion changes and the triumphs of one decade are often paled by the newer lights and the fresher talent of the next, and the painter himself may hold a different opinion on the merits of the work over which he triumphed on its completion, which stares unaltered at him who looks at it with different eyes. But for him who has full confidence in his powers and in the permanence of his opinions, and has time allowed him sufficient to undertake the various operations in their proper sequence, this process seems to promise immortality, or such measure of it as may be gained by the conservation of his work such as he had imagined it, and in the condition in which his last completing touches left it.

ENCAUSTIC PAINTING

ENCAUSTIC is a term applied to a mode of painting in which the medium is wax, which was generally mixed with the colours, the final process being the "inustion" or καῦσις, the application of heat, to fuse the colours together. The wax most frequently mentioned as used by the painters of antiquity is "Punic" wax, which was merely wax bleached. The process as described by Dioscorides and Pliny was to expose yellow wax to the air, and then boil it in sea-water to which nitre had been added: the whitest part was taken out with spoons and put into a pot of cold water. It was again boiled in sea-water and again put into cold water. After doing this three times it was dried on rushes in the open air either by sun or moonlight.

There were several kinds of encaustic—in the first sticks of coloured wax resins, which were melted by means of heat, were used; in the second they were used cold, softened by the addition of oil, like pastels, and were afterwards worked with heat; and in a third the

wax colours were probably used dissolved in an essential oil and applied with a brush. The implements required were—first, a colour box with coloured wax pencils; second, a little stove to melt the wax; third, brushes; fourth, instruments of metal, either iron or bronze, having the form of a spatula and called technically "cestrum" and generically "cauteria." In 1847, at S. Médard-des-Prés in Vendée, some utensils and materials for encaustic painting were found in a tomb. These consisted of a bronze colour-box, several bronze spatulas (cestra), two instruments of rock crystal, one of which contained gold powder mixed with a gummy substance, two brush handles, a palette made of basalt, and several glass bottles and phials filled with colours and resin. Some of them also contained bees-wax, wax and resin mixed, and a complex mixture of oleic acid and "margarique," wax and lamp-black, "no doubt from the acidulation of a neutral oil mixed with the wax." The colours found were blue, sienna earth, and Egyptian blue. At Pompeii, in the street of Stabia, a mortar, pieces of pumice stone, asphaltum, and a mixture of asphaltum and pitch, a piece of yellow ochre, with portions of tar, lamp-black, red and yellow ochre, blue, and two sorts of white were found together.

The colours used by the Egyptians are light yellow ochre, orpiment (sulphate of arsenic) or a vegetable

Fresco by Pinturricchio, in the Library of Siena Cathedral.

THE BETROTHAL OF FREDERICK III. TO ELEANORA OF PORTUGAL.

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Main

yellow, red ochre (burnt yellow ochre) or vermilion, and three blues—a dark copper blue, indigo, and a pale oxide of copper blue. All the greens are olive in tone and depend on copper for their colour. The whites are—first plaster mixed with a gluey medium, a chalk white, the white which was made by grinding up rings of white glass or bracelets of white enamel, and, perhaps, white lead. The blacks are charcoal, oxide of iron, and manganese, or sulphate of lead. Pliny says that the Greeks painted with vermilion (minium, really red lead) pictures which they called monochromes. For a long time they used only four colours—earth of Melos for white, "sil" (attic ochre) for yellow, Pontic "sinopis" for red, and "atramentum" for black; but he describes a picture of Venus by Apelles in which the sea was blue. Blue is found in all the Etruscan paintings in the tombs. At Nola, Pæstum, Ruvo, Corneto, etc., one sees in the red flesh a sort of red chalk; where yellow is occasionally employed it is a brilliant ochre; the blue is a natural powdered copper colour mixed with an earthy substance—united with yellow it makes an agreeable green; but a copper-green has not yet been found. The black is charcoal. These are colouring matters which are abundant in the country.

Vitruvius distinguishes between natural colours which are formed in the places where they are

found, and artificially made colours. The natural colours were: (1) Yellow ochre, called by the Latins "sil"; the best, that of Attica, was no longer found in his time; to imitate it the dyers threw on to Eretrian chalk an infusion of dried violets, a detail which one does not quite understand. (2) "Rubrica," Ruddle, a red chalk which was only found at Sinope, in the kingdom of Pontus, in Egypt, in the Balearic Isles, in Spain, and in the isle of Lemnos. (3) "Paretonian" colour, which he does not describe, but which Pliny says is a fantastic mixture of slime and the foam of the sea solidified; it is the thickest of the white colours. (4) "Meline," which takes its name from the island of Melos. (5) Terre verte (oxide of copper or of silver, with earthy particles), of which the best came from Smyrna. (6) Orpiment, called by the Greeks ἀρσενικόν, our sulphate of arsenic. (7) Sandarac, our minium, oxide of lead. (8) Minium, which was found near Ephesus, and which is our vermilion or sulphuret of mercury. (9) Chrysocolla, without doubt a silicate of copper, which was sometimes replaced, Vitruvius says, by tinting blue with the juice of a plant, our dyer's greenweed. (10) Armenium and indicum, the last, no doubt, our indigo. The artificial colours were (1) Lamp-black (atramentum). (2) Egyptian azure blue (cœruleum). (3) Burnt ochre. (4) Ceruse (basic carbonate of lead). (5) Verdigris, called "æruca."

(6) Minium (sandaraca), coming from burnt white lead. (7) Purple, which was made from shell fish, a very precious colour, called for that reason "ostrum," or from the roots of madder and of "hysginum," a plant not yet identified, though some think it to be the lichen "roccella tinctorium." Another way of making it was with an infusion of "vaccinium" (myrtle) poured on Eretrian chalk.*

Pliny says that the colours which require a dry, chalky ground are purpurissimum, indicum, cœruleum, melinum, orpiment, appianum, and white lead.

The colours found in a shop at Pompeii were analysed

* In the notes to Bohn's edition of Pliny's *Natural History* many of the ancient colours are identified: for instance, rubrica is red ochre, peroxide of iron mixed with argillaceous earth; cinnabaris is properly dragon's blood, confused by the physicians with minium, which was discovered in 439 A.U.C. by Callias the Athenian by submitting to the action of fire the red sand found in the silver mines (sulphuret of mercury), according to Theophrastus. The name minium was also applied to red oxide of lead. Colours which were called "florid" were supplied to the painter by his employer, on account of their cost—minium, armenium, cinnabaris, chrysocolla, indicum, and purpurissimum. Chrysocolla is generally thought to have been green verditer, carbonate and hydro-carbonate of copper, green and blue; when treated with dyer's greenweed the best rendered exactly the tint of young corn. Under Nero the arena of the circus was once sanded with chrysocolla when the prince himself, clad in a dress of the same colour, was about to exhibit as a charioteer. Sinopis, named from Sinope, was a brown-red ochre, red oxide of iron. Parætonium, said to be sea foam solidified with slime, was probably either a hydro-silicate of magnesia or steatite, or rhomboidical carbonate of lime. It was

in 1809 by M. Chaptal, who found: (1) A clay-like terra verte of Verona. (2) Very pure and fine yellow ochre. (3) Red-brown ochre. (4) A sort of white pumice; very white, fine, and close. (5) A frit of dark blue glass, containing oxides of copper, of lime, and of alumina. (6) Another blue a little lighter. (7) A fine rose colour, which he thought was madder.

Sir Humphry Davy analysed some Roman fragments of coloured plasters and found: White—several kinds of chalks and earths. Yellow—yellow ochres, which became reddish on being warmed; he also found massicot. Blue—a glass frit made of soda and oxide of copper, which, by mixing a little lime or other white, became lighter or darker; oxide of cobalt furnished more transparent blue. Red was neither

a white used for fresco. Cœruleum may have been ultramarine sometimes, but was generally copper ochre. Pliny says that Vitruvius is wrong in calling red oxide of lead "sandarac." This name is properly applied to massicot, yellow oxide of lead, and a mixture of it with minium; also to realgar, a red sulphuret of arsenic. Sandyx was made of calcined sandarac and an equal proportion of rubrica. Syricum was a combination of sinopis with candyx, but according to Ætius was the same as "usta," calcined white lead. Atramentum was a black colouring substance, either a deuto-sulphate of copper in solution in gallic acid, lamp-black, or calcined wine lees. Armenium was much the same colour as cœruleum, and admitted of being dyed. Appianum was a fair imitation of chrysocolla, prepared from a green chalk. Annularian white was a kind of chalk combined with the vitreous paste "which the lower classes wear in their signet rings."

Fresco by Andrea Mantegna, in the Camera degli Sposi, in the Castle, Mantua.

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madder nor cochineal, more like the second than the first, a modification of purpurissimum, with which chalk was coloured; minium and vermilion.

In 1826 H. Geiger found in Italian plasters and coloured stuccoes: Red—vermilion mixed with oxide of iron and a little carbonate of lime. Light red—oxide of iron and lime. Violet—oxide of iron mixed with carbonate of lime. Yellowish brown or brownish pale yellow. Black—oxide of iron mixed with silica, a little sulphate of magnesia and of aluminum. Yellow—oxide of iron.

M. Chevreul found in the red plaster from the temple of Jupiter Olympus at Girgenti peroxide of iron, and in a yellowish stucco fine sand mixed with flakes of silica and ferruginous aluminum. A red plaster from Pompeii gave organic oxide of iron, a black one lamp-black, a yellow one yellow ochre, a white one fat lime mixed with marble (on this plaster was a red band painted with sulphuret of mercury and a green one painted with Veronese earth). The fragments found at the Palais de Justice, Paris, in 1848 showed the same colours. Hittorff says: "The colours, whether in Egypt, Etruria, Greece, Sicily, Italy, or France, are composed of the same substances, which are natural or artificial metallic oxides. Only one colour seemed to be a lake," a conclusion which the analyses reported above confirm.

The process of painting was as follows. The sticks of coloured wax resins were melted by heat into little pots, or on a palette containing them made of metal, and the tones applied to the panel with a brush. Heated irons, sometimes even red hot, were used to unite the tones. On the cooled palette the intermediate tones could be taken up and mixed with irons which were kept hot. The ancients knew how to dissolve resin in essential oils, and to mix colours with nut oil, which Ætius says is useful to gilders and workers in encaustic, since it dries and long preserves their work "containing it." This suggests a kind of varnish, some sort of which was certainly used under the name of "atramentum."

Encaustic on ivory was worked in the following manner. The outlines of the subject were engraved with the burin, the shadows indicated, and the hollows were filled up with coloured wax, either dissolved or melted—apparently a kind of niello. For painting ships the wax was mixed with pitch, when scraped from them after long use called "zopissa." When used on walls the plaster was first made so hard and polished that it reflected objects, and was then painted either in distemper or fresco, as both Pliny and Vitruvius say, and afterwards, when the wall was quite dry, a coat of melted Punic wax mixed with a little oil was applied with a hoghair brush; then the wall was

warmed with a small charcoal furnace so as to melt the wax and unite it well. It was then well polished with a roller of wax and a clean cloth, "as is done with marble statues. This operation, which the Greeks call καῦσις, covers the plaster with a breastplate of wax which preserves the colour from the light of the moon and the rays of the sun." In fact, almost every colour was employed in encaustic without restriction, such as orpiment, red lead, and other evanescent colours; wax having the property of preserving them from the action of light and from atmospherical changes. Latilla is responsible for the last statement, and as he painted in encaustic in the Banqueting-Room at Beaufort House, he may be supposed to have made experiments which satisfied him that it was so.

Pliny says that M. Agrippa paid the people of Cyzicus 1,200,000 sesterces for two paintings, an Ajax and a Venus. And that he ordered small paintings to be set in marble in the very hottest part of his warm baths, where they remained for a considerable time. The insertion of pictures into walls seems to have been a common practice. One, inserted by the Emperor Augustus in the Curia which he consecrated in the Comitium, was signed by the artist Nicias with a statement that it was in encaustic. Yet at the end of his catalogue of colours he says that wax is stained with all these colours for encaustic painting, *a process which*

does not admit of being applied to walls (!) but is in common use by way of ornament for ships of war, etc. The process was much used for the external decoration of buildings. A varnish was used in Egypt to protect the surface of paintings, made of resins, and at Hadrian's Villa at Tivoli one of wax was found.

The media used in encaustic are called by several ancient authors by the name of "Pharmaca." Suidas says that naphtha was called "Pharmacon," which suggested to Emëric-David that we had here an explanation of the possibility of painting in wax with the brush. He says that the wall first received a coat of oil, then a second of Greek pitch (pine resin from which the oil had been extracted), mastic, and other materials of that nature. A chafing dish was then applied to the wall to make the resins penetrate it. On this coat was applied the painting ground, which was composed of wax, mastic perhaps, and a colouring matter, generally white, on which the artist painted with colours which had been mixed with a medium of wax and resin, ground up and applied with water only. (A wooden tablet prepared for painting was found at Pompeii, and partly confirmed the experiences of the Abbé Réquéno, whose experiments are here resumed.) A varnish was next spread over the painting, probably composed of wax, mastic, and some liquid bitumen, and

Portion of the ceiling of the Sistine Chapel, Rome, by Michel Angelo.

THE PROPHET ISAIAH.

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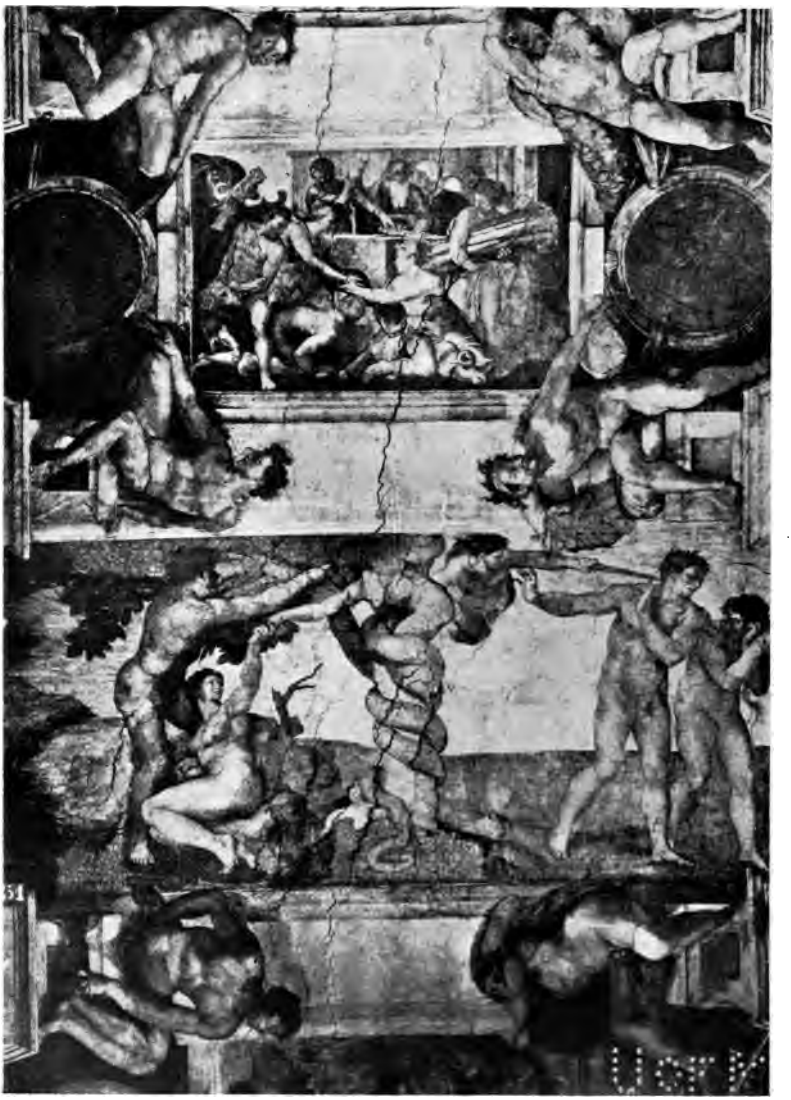
Not for

then came the "inustion," interior burning, with the chafing dish which united the various layers of resins by the application of heat.

The tradition of the use of wax has lasted to the present day. The paintings of Buffalmacco in the Campo Santo at Pisa are done on a thin coat of wax, which appears to have been applied mixed with a volatile oil on a light plaster composed of a tenacious substance of a yellow colour soluble in water. The gold of Benozzo Gozzoli's paintings in the same place, separated from the ground by immersion in boiling distilled water, showed pellicules of wax on its surface. Cœlius Rhodiginus of Rovigo in the fifteenth century writes to explain the use of the "cauterium," and Lucas Cranach painted a portrait of Luther in wax in 1520, as the inscription states. Wax is used in the preparation of Milanese stuccoes at the present day. The walls are first covered with several layers of ordinary mortar, and over these before they are dry a new plaster of one-sixteenth of an inch is spread, made of very fine sand and lime, for which they use a hard wood trowel of the form of a parallelogram. On this plaster while still damp they apply another of the same thickness made of marble dust and lime slaked at least a fortnight before it is used. When this is almost dry it is covered with another layer of stucco made of one-third marble dust and two-thirds lime, after which, if

a white ground is required, pure lime is spread on the surface, if colours are desired they must first be mixed with the lime and marble dust of the second coat, and afterwards they cover the surface two or three times with very liquid colour made with lime-water and soap-water. On this stucco they paint with a brush or sponge, allow it to dry, and then taking a little iron trowel which is warmed pass the back of it over the stuccoed surface till it is quite glossy. Finally, with a composition formed of three and a half ounces of wax and six ounces of soap, melted on the fire and dissolved in two bottles of boiling water, the stucco is covered several times, and then the trowel with a round back is passed rapidly over the already shiny stucco. Although the iron is cold the movement of rotation produces a considerable heat which replaces the καῦσις.

MM. Cros and Henry give some personal practical notes on encaustic which are exceedingly valuable and which include a list of colours and of the varying quantity of wax which should be mixed with the powders, according to their depth of tint, taken from Count Caylus. The wax itself should be pure and white, and should have added to it half its weight of refined pine resin, called by the French "colophane," in English, black resin (which they say should be as pale as possible). This gives greater brilliancy and tenacity



Part of the ceiling of the Sistine Chapel, Rome, by Michel Angelo.

THE FALL, AND SACRIFICE OF NOAH.

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NOTICE

to the colours. The list is as follows (quantities by weight):—

White lead	30	Naples yellow	30
Wax	18	Wax	16
Flake white	30	Charcoal black	30
Wax	20	Wax	45
Vermilion	90	Ivory black	30
Wax	40	Wax	40
Carmine	30	Lamp-black	30
Wax	45	Wax	40
Lake	30	Cologne earth	30
Wax	45	Wax	45
Green lake	30	Verditer	30
Wax	38	Wax	24
Ultramarine	30	Stil de grain d'Angleterre (brown pink?)	30
Wax	30	Wax	45
Prussian blue	30	Rouge brun d'Angleterre (light red)	30
Wax	60	Wax	30
Yellow ochre	30	Stil de grain de Troyes	30
Wax	40	Wax	45
Ocre de Ru	30	Email fin d'Angleterre	30
Wax	40	Wax	15
Burnt ochre	30		
Wax	40		
Terre d'Italie	30		
Wax	40		

The necessary implements are first a small charcoal furnace upon which to keep the palette warm when using the brush, to warm the irons with which to continue the painting and to prepare the coloured wax; then the hot palette, which is a disc of tinned metal,

iron or copper, with saucer-shaped holes sunk in it, leaving a flat portion on which to mix tints (it should have an iron handle covered with wood so that it may be held comfortably); brushes of hoghair—but even badger may be used, if you are careful not to put them in too hot wax or to let them get out of shape by remaining too long on the hot palette; and several iron spatulas, bent at the ends so that the hand may follow the work without hiding it. Count Caylus' medium was made of wax liquefied in water by an infusion of salt of tartar. Bachelier also thought of this. He said that if oil was mixed with the wax it should be colourless and a powerful drier.

To prepare the rods of colour, you place on a mild fire a metal pot, tinned inside or enamelled (which is better). At the bottom you place the colour in fine powder; then with half a cake of wax you turn the colour as if you were mixing it. From time to time you throw into this mixture liquefied by the heat an equal quantity of resin, or more if you wish it. When the colour is equally distributed through the mixture you pour it out into channeled moulds. In this way all sorts of mixed colours may be made, such as half tints and shadows, the blues of skies, greens of landscapes, etc.

Any surface may be painted on, but you must make sure that it is not damp. The brush-work should give

Creation subject from the ceiling of the Sistine Chapel, Rome, by Michel Angelo.

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a vigorous look to the sketch if it has been rapid and well touched in, before the heated irons are used to unite the tints. All colours may be used with wax, since it locks them up. The colours dry almost immediately and retouchings can be executed for an indefinite period without scraping away. The cold palette used in retouching is of wood, and on it the colours in frequent use are placed in the form of pastilles. "The wax gives a silky reflex to the tones, and the subjects painted thus acquire a marvellous intensity of life. Encaustic does not scale off; neither the sun nor the heat of rooms makes any alteration in the colours, and worms and damp are kept away by the wax. It attracts dust very little and does not change at all with time."

The process has attracted a great deal of interest in France, and several painters made exhaustive experiments with various forms of wax mediums and published the results. Of these the most complete was M. Paillot de Montabert's, whose process was used, with some modifications, by Hip. Flandrin, in his beautiful paintings in the church of S. Vincent de Paul in Paris, and elsewhere. The mastic used on the Dome of the Panthéon, Paris, was made of two parts boiled linseed oil and one part wax. "Warm the oil with powdered litharge for several hours, stirring the mixture from time to time. Then pour off the clear

oil, melt the wax and add the oil, keeping the heat up till it is quietly boiling. Steam arises at first, which makes it appear to boil. Let the mastic cool and it will keep indefinitely." To apply it, and make it penetrate the stone on which the painting is to be done, the surface has to be warmed with a portable stove. When it is very dry and warm the mastic is applied, warm also, with a stiff brush, more being added till it ceases to sink in; a further warming causes the mastic on the surface to disappear. The medium used was thus made:—

Virgin wax, perfectly pure	. . one part.
Volatile oil or essence of lavender spike	one part.
Pure Élémi resin	. 1–16th of the spike oil.

Sometimes oil of wax and copal resin were added, according as the medium was required softer or more unctuous.*

The preparation is begun by softening the wax on the fire as well as the resins, if they are not already dissolved in the spirit and concentrated to the thick-

* To prepare oil of wax you take yellow wax and unslaked lime in equal parts, melt them together in a basin so as to make pellets, put these pellets into a retort of stone-ware, place this into a reverberating furnace, and warm it by degrees till red. First a few drops of water pass, and then the volatile oil. There are generally seven or eight ounces to each pound of wax. The first products of distillation are least charged with the smell of scorching. By redistilling the liquor becomes almost colourless."

ness of oils; then the spirit is poured in and the dissolving is hastened by stirring. With this medium the colours are ground; each colour requires a different amount of wax—experience shows how much. As the spirit evaporates more must be added, so that the colours may be equally liquid. A little oil (not more than one-fourth of the spirit) may be added without making the surface shiny. De Montabert also invented a wax varnish which could be used on water-colour paintings. He took wax which was softened over the fire, three or four drops of spike oil being added when the pot was taken off the fire. To the wax thus softened and divided some spoonfuls of well rectified spirits of wine were added, which boiled and evaporated quickly. Then more was added and the wax stirred, after which it divided into flakes while cooling. It was then well beaten with a spatula, with the addition of warm spirits of wine from time to time, and shaken at intervals. The wax divided and liquefied, forming an emulsion. With the addition of water and grinding with a muller a milk of wax was obtained, which was strained through crape or gauze and spread over the picture with a broad close badger left a dust of wax all over the surface when dry, which had only to be warmed and polished to give the effect of a varnish.

The preparation of the wall at S. Vincent de Paul

is described elaborately by M. Hittorff, who was the architect, but the paintings were not worked strictly according to rule. The wall was first well looked over, the joints filled up, and any doubtful places cut out and replaced. It was then well dusted and brushed over with a thin coat of perchloride of mercury (50 grammes to 8 litres of water), to destroy any vegetation which might have grown on plaster or stone. It was then warmed and dried with a portable furnace, not less than one foot from the wall, and made so hot that the hand could not touch it. It was then flooded with a gluten applied with a stiff brush till the wall would not absorb more, while the furnace was warming the next piece, and while still a little warm a first coat of colour was laid. The gluten was thus composed:—

One part	by	weight	of wax.
„	„	„	essence of turpentine.
„	„	„	linseed oil.
„	„	„	Venice turpentine.
„	„	„	thin amber varnish.
Half	„	„	„ white pitch.
Eighth	„	„	litharge.
„	„	„	metallic soap.

All these substances, except the metallic soap, were put together into a cauldron on a specially made furnace

Fresco by Raffaelle, in the Camera della Segnatura, in the Vatican.

THE DISPUTA DEL SACRAMENTO

ISSUED

with hermetically sealed opening so that the vapours should not catch light. When all was melted it was kept warm for half an hour, being stirred all the time with a spatula. The metallic soap was also dissolved over the fire in three times its weight of linseed oil and spirits of turpentine. The cauldrons were then taken off the fire and placed far away from each other; when they had cooled a little the soap was poured little by little into the other cauldron, which was only half full because the effervescence is very great. As to the metallic soap it is made by a saturated solution of protoxide of iron, poured little by little into a concentrated solution of ordinary soap. Stirring these substances together with a wooden spoon a precipitate is formed; this is washed carefully until the water of washing only leaves a slight remainder.

The colour for priming was white lead with a tenth of its weight of bioxide of lead, mixed with gluten thus made:—

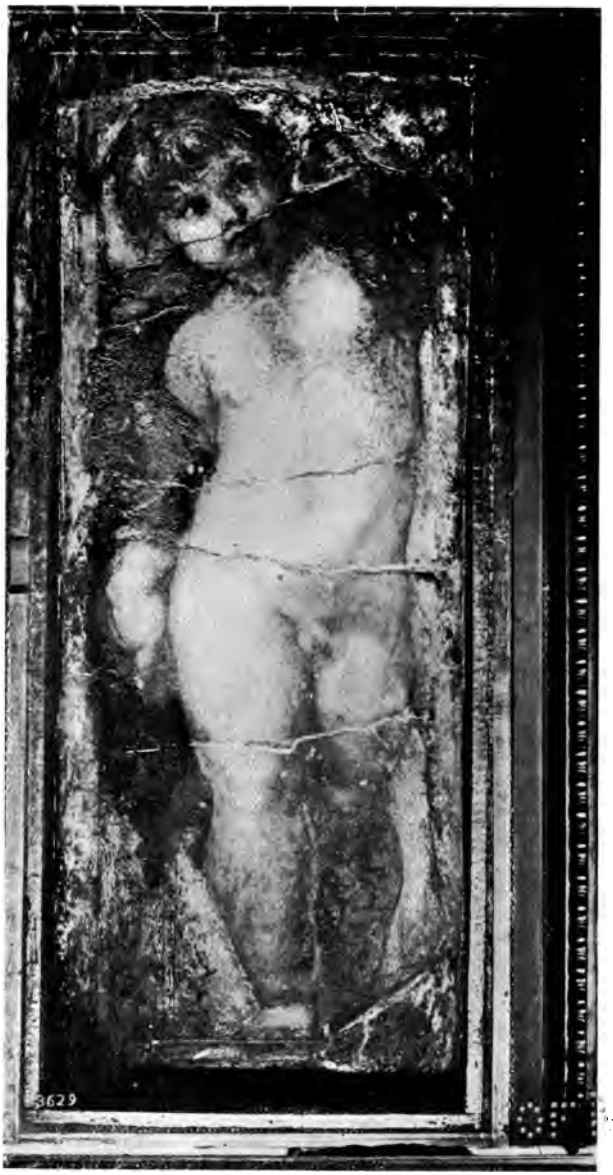
Wax	one part.
Spirits of turpentine . .	two parts.
Venice turpentine . .	one part.
Thin amber . . .	two parts.
Volatile oil of resin distilled .	one part.
Élémi resin . . .	half a part.

After applying this priming without any liquid it was

allowed to dry for six or eight days; then the joints and the larger cavities were filled with a mastic made thus:—

Litharge	20	grammes
White lead calcined, in powder	20	„
Umber	15	„
Talc or Terre à Jésus	20	„

mixed with 500 grammes of linseed oil. These substances were boiled on a gentle fire for two hours with frequent stirring until the oil did not blacken. Foam appeared, and when it became rare and red the cooking was done. It was then allowed to settle, and was drawn off clear. (N.B.—The older this mastic is the better.) The smaller cavities were filled with another mastic, for which the receipt is not given, and all was allowed to dry till the mastic had become very hard. These operations completed, the priming colour was mixed with flake white in powder stiff enough to trowel it, and it was thus spread on the wall, so as to get as smooth and even a surface as possible. Where it was necessary to add mastic it was done with thin layers and at intervals, so as to make sure of its getting dry through and thus avoiding cracks and warpings. It took a fortnight to dry, and was then brushed over with picture gluten, or medium, white being mixed with it, but not to such stiffness as to prevent the brush being used.



Fresco by Raffaelle, from the Sala di Costantino, in the Vatican.

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This picture medium was made thus:—

Pure wax . . .	one part.
Distilled turpentine . .	three parts.
Diluted naphtha . . .	half a part.
Spirits of copal . . .	one-third of a part.
Élémi gum . . .	„ „
Distilled essential oil of resin	one quarter of a part.

The medium used in 1849 by M. Picot was slightly different:—

Wax	one part.
Distilled essence of turpentine	three and a half parts.
Spirit copal varnish . .	one-fifth of a part.
Purified white of whale . .	one-quarter of a part.
Naphtha or "demi baume" .	half a part.

The whole was melted in a bain-marie in a glazed earthenware pot. It was used on fresh plaster.

This priming was allowed to dry for seven or eight days, and then a second coat was spread bit by bit and dabbed while wet so as to obtain a roughened surface. It is advantageous to allow such a ground a long time to dry.

Hittorff quotes from Fernbach an account of how some of the paintings at Munich were done, commencing with the building of the inner wall with an air space of several inches between it and the

wall of the palace. The preparation of the wall up to the completion of the plastering is the same as described previously, but the detail of the opening of the windows when fine to assist the drying, and keeping them shut in wet or foggy weather, marks the northern climate and the corresponding difficulties of the mural painter. The gluten was thus made: into a pot 1·50 kil. of wax cut into little slices was put, and 7·50 kil. of spirits of turpentine (not rectified) added; they were left for a day to dissolve, and then 0·875 kil. of Venice turpentine was mixed in. The mixture was carefully warmed to avoid its catching light, and the wall heated with a portable stove. To the warm wall the gluten was applied with a brush carefully and equally; 9 to 10 kils. of it covered about 150 square feet. A thick solution of amber, in the proportion of one-third, was then added, and the mixture passed over the still warm wall, so that it penetrated well. The hand furnace was kept two feet away from the wall, and any blisters were knocked off, the place filled up with plaster in thin coats, and then finished with the wax.

The first priming of colour was composed of 2 kil. of flake white and 0·50 kil. of white chalk, mixed with 0·625 kil. of a thick solution of amber thinned with 0·125 kil. of poppy oil, to which 0·50 kil. of the wax gluten was added. All these substances were put

together in a pot, then ground on a slab of marble, thinning them a little with spirits of turpentine. The colour was carefully applied with a large brush from top to bottom of the wall, following with a dry brush to make the surface smooth and uniform. On this surface, when quite dry, the last coat of wax and turpentine, mixed with a little amber, was applied about a fortnight before the paintings were commenced. The colours were mixed with amber, wax, and india-rubber, together with the wax gluten; and six months or a year after the completion of the painting the surface was finished with wax and "inustion." The wax used was very old, and was treated for twenty-four hours to soften it; 1·50 kil. of it was then put into a glazed pot with 0·38 kil. of Venice turpentine. On the day it was to be used it was warmed in a bain-marie till it was clear and warm to the hand; it was then applied with a three-inch brush decidedly and smoothly without retouching. Forty-eight hours later another similar coat was given, and after another twenty-four or forty-eight a third. It was left for three days, and then the "inustion" was done with the portable furnace, and after another three or four days the surface was gently polished.

Mrs. Merrifield describes a mode of painting which she saw in use by a Parmesan painter, in which the medium was wax and resin dissolved in spirits of

turpentine, which may serve as transition to the processes in which heat is not made use of. The mixture was fluid and of the colour of milk. The colours were ground in it and kept in small glasses floated with spirits of turpentine and covered with a leather cover to keep out air and dust. All colours could be used indiscriminately with this medium, even prussian blue and orpiment. The ground was the usual plaster, and the painting was done on it, when quite dry, without any further preparation. The colours were diluted with turpentine and dried rapidly.

Note.

The colours used by the ancients have been discussed in this chapter, and a similar note upon those in use in the Middle Ages, from the data furnished by Theophilus, Jehan le Bègue, and Cennino Cennini, may be of interest. To begin with black and white. Black was made from the same materials as are used now, with the addition of burnt bone and ivory. The black earth of Rome and of Venice is mentioned in treatises on fresco, but is not any longer used. A caution may be given as to the effect which some blacks have upon pigments with which they may be mixed. Charcoal black decolorises organic pigments by precipitating their particles; and ivory black and colours allied to it do this in a greater, and lamp-black in a less, degree. Mérimée

Fresco by Sodoma, in her chapel, S. Domenico, Siena.

THE ECSTASY OF S. CATHERINE OF SIENA.

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Mrgoll

says that well calcined and washed lamp-black may be used without danger. The fresco white, lime, was called Bianco San Giovanni, and white lead was variously known as Biacca and Cerusa, the "psimmithin" of the ancients. Theophilus confines its use to plaster-work, wood, or canvas. It is the only white pigment of the Lucca MS. and of the Hermeneia, except the lime for wall-painting; but calcined bones were sometimes used as well as pounded eggshells. The yellows were yellow ochre, a natural earth, auripigmentum, orpiment, not the colour now known by that name, but a pale yellow, king's yellow, which is a yellow sulphide of arsenic. Since it can be mixed with no colour containing lead or copper, a white made from calcined stags' horns was used to lighten it. Massicot is a pale yellow, a protoxide of lead produced during the combustion of lead in the preparation of minium. Mrs. Herringham thinks this may be the "arzica" of Cennini, since in Spain it is called azarcon. Hendrie, however, says that is Theophilus' "flavus color," burnt ceruse. The red opiment, called by Cennini "risalgallo," was known to Theophilus as "sandaracha," the Zarnichahmer of the Arabs. This fine colour, though difficult to make use of, is permanent upon ochres and when kept from contact with other colours. Another yellow used was Naples yellow, called by Cennini "giallorino," an antimoniate of lead, believed by him to be a native mineral of volcanic origin. The term "sinopia" or "sinopis" includes all bright red ochreous earths. These red earths are extraordinarily permanent upon plaster. The modern Venetian reds are often artificial and seldom free from soluble salts and sulphates. The sinopis varied considerably in colour, and is sometimes used for a colour like Indian red—the

trit-oxide. Pliny shows the same inaccuracy in his description of this colour, if the "usta," without which shadows could not be made, refers to it, as seems probable. A factitious bright sinoper was also used, called "rubeum," and "amatito," hæmatite, is another name for the ferric oxides which supply us with Indian red and other ochres, of which a hard, crystalline variety seems to have been known to fresco painters, which was very crimson in tint. Vasari mentions *matita dura*, which, when ground, was to be used with *matita rossa*. Mrs. Merrifield found that specimens from Roche, in Cornwall, calcined, varied in colour from lake to violet, according to the length of time they were in the fire. Cennini says it makes the colour of cardinals' dresses, which at that period was purple. "Cenobrium," cinnabar, is our vermilion, a sulphuret of mercury. It was also called minium, and this name was passed on the red lead, because the more costly material was often adulterated with it. Pliny says of the true minium, which was brought to Rome from Spain, forming part of the revenues of the Roman people: "Indeed there is nothing guarded with a more constant circumspection, for it is not allowable to reduce and refine the ore upon the spot, it being brought to Rome in a crude state and under seal, to the amount of 2,000 lbs. per annum. At Rome the process of washing is performed, and in the sale of it the price is regulated by statute, not being allowed to exceed seventy sesterces per pound." Red arsenic and red ochres were also used to adulterate it. The earliest clear account of the process of making vermilion artificially is given in the Lucca MS. (ascribed to the eighth century). The crystalline red form is identical in composition with the

black amorphous sulphide of mercury, and sunlight has the effect of changing red into black. When the colour is locked up with oil and varnish this change does not take place, and judging from tempera pictures the medium used in them also protects it. It has also lasted in frescoes in rooms. In ancient treatises the context is necessary to identify any pigment named, on account of the loose way in which terms were used. In later northern writings, for instance, sinopia means madder. "Vermiculum" generally means kermes lake, and a hard red ochre is sometimes called "cinnabar," a word which, to the Greeks, meant vermilion, but to Pliny dragon's blood. This last is the resin of various plants, especially *Dracæna draco*, the dragon tree of Teneriffe. "Lacca" means lake; the pinks and crimsons of the early Italians have not yet been identified, but the raw materials were kermes (*coccus illicis*), gum lac, and "Verzino" (brazilwood). The use of balsams appears to prevent the fading of lakes which have been considered as hopelessly fugitive. "Folium" appears to have been a general term for vegetable reds and red purples, and also for vegetable blues. From a passage in Peter of S. Audemar it may be identified with our madder. Other vegetable colours used, which must have proved very fugitive, were "safferano" (saffron), "manisch" (a tender violet colour made from the juice of the elder berries), "succus" (a green made from the sap of various plants), and "indicum" (indigo). The introduction of the last gradually put an end to the culture of woad (*isatis tinctoria*). "Viridis," or "verde terra," was the green earth, of which the best came from Verona. "Verde azurro" was a carbonate of copper, the chrysocolla of Pliny, green verditer; it is blackened by sulphur. "Verde

rame," verdigris, is an acetate of copper, which can only be used in a spirit or turpentine varnish; when used for manuscripts it was tempered with wine alone. "Prasinus" appears to have been the same thing, but was certainly used for wall-painting. The blues were "Lazur," or "Azurro della magna," the male cyanus of the Greeks, a native carbonate of copper (perhaps Pliny's "armenium," mountain blue or blue verditer); and "Azurro oltremarine," true ultramarine. Some think that this was the "cyanus" of the Romans; but there is no certainty either way. Though exceedingly expensive always, its power and covering capacity are so great, and the beauty of its colour so extreme, that it has been much used. In Le Bègue's MS. it is said to be worth its weight in gold; the best now costs, retail, *twice* its weight in gold! In Cennini's time the stones cost two to five ducats (twenty to fifty shillings) the pound, and the German blue sixpence to one shilling and threepence; and the best ultramarine was worth fifty shillings the ounce, and the German ten to thirty shillings the pound. Sometimes an unscrupulous miniaturist would scrape it off from the backgrounds of miniatures to use again.

Theophilus also mentions several compound colours. "Exedra," or "exudra," a mixture of red and a little black, to relieve and finish the flesh. "Posc," a mixture of green and red with "membrina" (a kind of purple); "Veneda," a grey made of black and white lead or lime, and "Prasinus," which he says is green colour with black. "Pallidus," is a colour not quite white, but somewhat inclined to shadow. He commences his chapter on the tempering of colours (in the appendix in Hendrie's edition) thus: "The 'blue of the Saracens' is good. Also

Fresco by Luini, now in the Gallery of the Brera, Milan.

THE BURIAL OF S. CATHERINE OF ALEXANDRIA.

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another, 'Roman blue,' and another called 'indigo.' Greek green, green earth, vermilion, minium, white of Apulia, bone white, and white lead, brisil, orpiment, ochre, saffron, sinoper, the preparation of 'brunus,' gypsum, folium." This list includes several colours not mentioned elsewhere.

SPIRIT FRESCO

GAMBIER PARRY'S PROCESS

THE process invented by Mr. Gambier Parry, and used by him in his paintings in S. Andrew's chapel, Gloucester cathedral, and in Highnam church, was thought so well of by the late Lord Leighton, after using it in Lyndhurst church, that he chose to execute his two great frescoes in the Victoria and Albert Museum in this medium (which, however, show some signs of perishing), and as long ago as 1864 spoke of it in high terms, saying that it was so like buon fresco in its effect as to deceive anyone not conversant with the practice of painting; that it allowed a great range of colour, embracing the whole palette of the oil painter, being free from the limitations which are peculiar to fresco in that particular, as well as in other directions. The manipulation he found very easy, washes, impasto, and glazing being all possible within the space of a few hours, while there was little or no change in the effect after drying, "not more than in a water-colour drawing on absorbent sketching paper." Another point in

its favour was the facility of retouching, as the surface is always soluble in spirit, though proof against water. He said that the only point in which he thought it inferior to true fresco was in the absence of that pure crystalline quality of light so peculiar to the latter. The Lords of the Committee of Council on Education asked Mr. Gambier Parry to prepare an account of the process for the information of students in schools of Art, and the technical details here given are taken from this authoritative account.

The advantages claimed for it are: durability, power to resist damp and changes of temperature, freedom from all chemical action on the colours, a matt surface, and a luminous effect. The preparation of the wall is a matter of great importance, but Mr. Gambier Parry was content to accept the ordinary plastering of the interior of buildings if carefully executed, and no doubt it was generally better done thirty years ago than it is now. He says that "the one primary necessity is that it should be left with its natural surface, its porous quality being absolutely essential. All smoothing process or 'floating' with plaster of Paris destroys this quality. All cements must be avoided, some of them having too hard and smooth a surface, and others being liable to efflorescence and chemical action." Stucco on a wall of good, dry brick, is best; next coarse and porous bath stone or other porous free stone. Sand

papering fills the pores with powder, and is therefore objectionable. Professor Church says emphatically: "Under no circumstances should cements containing plaster of Paris be introduced into the grounds used for spirit fresco." He is more exacting than Mr. Gambier Parry in the matter of grounds, and expects that the wall shall be specially plastered. He recommends syringing with distilled water charged with carbonic acid gas under pressure as hastening the carbonation of the lime, though it delays the drying of the wall.

The medium used by Mr. Gambier Parry is made of the following materials in these proportions:—

Elémi resin . . .	2 ozs.	by weight
Pure white wax . . .	4 ozs.	
Oil of spike lavender . .	8 ozs.	liquid
Finest preparation of artist's copal	20 ozs.	measure

(If a stronger kind of copal is used 18 ozs. are sufficient.)

The utensils required for the making of the medium (which should be prepared in the open air, as every ingredient is inflammable) are two pots, one large and one small, a long spoon, and a charcoal stove. Two ounces of elémi resin are melted in two ounces of rectified turpentine in the small pot, and strained through muslin into the larger pot. Mr. Parry says

Spirit fresco at Lyndhurst church. By Lord Leighton, P.R.A.

THE PARABLE OF THE TEN VIRGINS.

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Not for Sale

the one which he uses is of copper, six inches across and eighteen inches high, with a flange near the bottom to make it stand securely on the charcoal. Into this four ounces of white wax are put in small pieces. When all is melted the twenty ounces of copal are added and all boiled together to a white foam, stirring well with a spoon which reaches to the bottom. It is to be removed from the fire and then boiled again, after which eight ounces of spike oil are added.

Mr. Parry decanted his medium into strong, clear, quart glass bottles, so that the condition of the medium was always visible, leaving them uncorked to cool. "When used, the bottles may require shaking, from the weight of the wax they will tend to thicken at the bottom." With this medium all the colours were mixed as powder on a slab and put into tubes. Mr. Parry says he has many in tubes above twenty years old, as fresh as when put in them.

The wall surface requires dry and warm weather for its final preparation. The amount of medium required (which is not stated) must be diluted with once and a half its bulk of good turpentine. Mr. Parry recommends that this should be done over a dull charcoal fire. With this wash the wall is to be well saturated, "the liquid being dashed against it rather than merely washed over it." The process is repeated two days later. A few days are allowed for evaporation, and

then the priming is laid on thickly, made of equal quantities of white lead in powder and gilder's whitening, mixed in medium slightly diluted with about a third of turpentine, and applied with a brush. When it is sufficiently evaporated to bear a second coat "add it as thickly as a brush can lay it. In two or three weeks it will be dry and "a perfect surface" is the result—"so white that colours upon it have all the internal light of buon fresco and the transparency of pure water colours, and it is so absorbent that their attachment is complete."

The actual painting should be done boldly and simply, using spike oil freely from the dipper. If the surface is worried the resins rise to the surface and perfect deadness is lost. If the surface is quite hard it may be washed over with spike oil to soften it so that the colours may be well incorporated with the ground. Transparent glazes are less likely to dry dead than colours used with white lead.

"The Rationale of the painting is this: that the colours in powder being incorporated with material identical with that which has already sunk deep into the pores of the wall surface, and has hardened there by the evaporation of the spirit vehicle, may be regarded as belonging to the mass of the wall itself." The spike oil is the one common solvent, "the moment the painter's brush touches the surface it opens to

receive the colours, and on the rapid evaporation of the spike oil it closes them in, and thus the work is done." Mr. Parry gives a caution against allowing spike oil or turpentine to run down over or be sprinkled upon the work as a shiny spot is thus produced, which is indelible except by solid over-painting. Great cleanliness is necessary, brushes, palette, etc., having to be cleaned with turpentine at the close of the day's work to avoid the unpleasant stickiness otherwise resulting. It is important to make sure of the genuineness of the materials used in compounding the medium.

Professor Church remarks that this medium contains two doubtful ingredients, elémi resin and wax, and recommends in preference a paraffin-copal medium, which he says is used in much the same way and involves the same chemical and physical changes. It is made thus: "Warm twelve ounces of oil of spike or non-resinifiable oil of turpentine in a glass flask plunged in water heated to the boiling-point, and then pour into it in a slender stream about four ounces by weight of paraffin wax (melting-point 58° to 62° C.) or of ceresin, or of a mixture of these materials. The mixture becomes perfectly clear if it be thoroughly agitated and maintained at a temperature of 80° C. Then twenty measured ounces of 'picture' copal varnish, or sixteen ounces of oil copal varnish, are slowly added, with constant shaking, in the same way.

It is of the highest importance that the copal varnish used should contain a sufficiency of oil. The paraffin-copal medium thus obtained may be diluted with oil of turpentine exactly as recommended by Gambier Parry with his medium and used in the same way and for the same purpose." "It is important to remember that the use of abundance of medium is necessary to bind the particles of pigments firmly together."

Frescoes by W. Dyce, R.A.

THE KING'S ROBING-ROOM, HOUSES OF PARLIAMENT.

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OIL PROCESSES

THE drawbacks to the use of the oil medium for wall-painting are several. The most evident is the condensation of vapour upon the surface. The more impervious the surface is to damp the more liable it is to be affected by damp from behind, which will, unless special precautions are taken, detach portions of the painted surface from the wall or burst through it in patches of efflorescence. The history of Leonardo da Vinci's "Last Supper" at Milan shows how fatal its use is, even in the hands of a master in art and science, and it is a matter for lasting regret that he did not trust to the older fresco medium with which the great "Crucifixion" at the other end of the refectory, still in excellent preservation, was painted. Another disadvantage is the darkening to which colours ground in oil are liable and the shininess of the surface in parts, which is very likely to occur notwithstanding careful surfacing with wax and turpentine. It is, however, the favourite medium of the French, and since the application of "marouflage"

to the fixing of large canvases on walls it is rare to hear of paintings being executed on the wall in France. This process makes it possible for the painting to be executed entirely in the studio and even exhibited in a picture-gallery (with doubtful benefit, since it cannot be in harmony with its surroundings there) before being placed in the position for which it was designed. Professor Max Koch gives his opinion very clearly as to the advantages of painting on plaster *in situ* and the disadvantages of the oil medium and "marouflage" thus: "The oil medium so much loved by the French is quite the least suitable technique for wall-painting. At first great surfaces shine so brightly that the beholder can only see a part of the picture clearly and then they darken with time surprisingly. Water colours give a much clearer, lighter tone of colour, do not shine, do not crack, and do not darken, and if properly handled are more lasting than oil." "For interior work one may either paint on the wall or on stretched canvas. I have made many studies in my various journeys, and have come to the conclusion that plaster painting is far the best for every reason. To me it is imperative to paint in the given place. In the studio one is never in the position to think of the relative spacing. I remember how a colleague (who was an easel painter) painted a nine-foot figure for the ceiling of an opera

house on canvas; when it was up, sixty or seventy feet away, he had to look with an opera-glass for the beauties which were invisible, though they had looked so pretty in the studio. He had to paint his figure twice on account of this miscalculation. The French generally paint their decorative pictures on canvas, while the Italians always worked on the wall, much to the benefit of decorative art, to my thinking."

The operation of "marouflage" has been developed from the "lining" of pictures by picture restorers. It is thus described in *La Grande Encyclopédie:* "Application to a canvas, panel, or ceiling, of an oil painting on canvas. 'Maroufle' is used for this purpose; a kind of glue, very concentrated by cooking, partly formed of the remains of brush washings, the tenacity of which is extreme." Mérimeé advises for the "lining" of pictures for damp situations the use of linseed oil thickened by long boiling, with which white lead and a little very fine red lead is to be ground. Let this get half dry and then lay the canvas down very carefully, pressing from the centre towards the edges with broad palette knives or a roller.

Professor Church says that the paintings in the Royal Exchange are "marouflé" on slate slabs slightly inclined forward at the top and with a ventilated air-space behind. The composition used was a thick paste

of white lead, oil, and copal varnish spread on the slate and the back of the picture at the same time. "It may be affirmed that paintings so secured are free from all risk of injury from the back," but of course the exposed surface requires protection either by some unaltering substance, such as paraffin wax, or by a material which can be removed when dirty and replaced without the surface of the paint being affected. Whatever the medium employed the air-space behind the surface on which the paint is applied very much increases the likelihood of its permanency, and if back and front are both protected and the colours used so as to avoid chemical changes, one is inclined to think that there can be no deterioration. If slate is used as a ground for spirit fresco or for oil painting, it must be free from crystals of iron pyrites (of a brass yellow colour). The firm adhesion of the priming may be secured by slowly warming the slate in a water oven, and then immediately covering it with a very thin coat of oil copal varnish largely diluted with turpentine and applied warm. When this is hard the painting may be carried on, or a priming of flake white in oil mixed with copal varnish and turpentine may be applied. Terra-cotta and stone may be treated in the same way, Professor Church says, and slate may be prepared for using Keim's process upon it by warming as before and then rubbing with paraffin wax. A second heating is

Fresco of "Hospitality." By W. Dyce, R.A. From the King's Robing-room, Houses of Parliament.

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required, after which the slate is to be rubbed with a cloth so as to remove any excess.

The most usual mode of securing the matt surface so desirable in wall-paintings, when oil is the medium which has been employed, is turpentine or benzine. These substances both act by causing a certain amount of the oil in which the colours have been ground to evaporate, thus lessening the chance of permanence of effect. It is possible to obtain the same effect by finishing with a mixture of wax and turpentine, like Parris's marble medium, but if this is used the application of it must be the final process, as the film of wax will prevent any subsequent touches of colour adhering to the subjacent layers. A process which was used a few years ago in the decoration of a semi dome (now destroyed) was to press canvas on to the wet plaster so that it came through the pores, thus forming a rough granulated surface, upon which the painting was executed with oil colours diluted with turpentine to a considerable extent, so that the colour sank into the plaster, the absorbency of which was not destroyed by the first coat of colour. This had the advantage of a matt surface and a plastery texture, which was pleasant, but was nearly as difficult to manage as fresco, without its advantages.

Mérimée gives the following instructions for preparing a wall for receiving painting in oil. When the

plaster is quite dry give the surface several coats of boiling linseed oil, and cover it afterwards with white lead or any colour preferred. To guard against the negligence of workmen in the preparation of the plaster an oily cement is preferable, which may be made of quicklime, linseed oil thickened by boiling or exposure, white lead and fine sand. If the oil is fresh the cement is so fluid that it runs down, though it becomes hard in a few days. A better preparation for the preliminary soaking is a mixture of drying oil and wax, as used in the Panthéon, Paris (by MM. Arcet and Thénard), warming the surface till the mixture no longer sinks in. On this preparation he says that the colours do not sink in.

LIMITATIONS AND CAPABILITIES

THE conventions which should govern wall-painting are founded partly on consideration of the position which the decoration is to occupy, partly on the material in which it is to be executed, and partly upon the subject chosen, which should be in harmony with the purpose to be served by the decorated building. Thus, an arrangement which is perfectly appropriate and satisfactory for an easel picture is generally quite out of place upon a wall, even if oil be the medium employed in rendering it; a scheme of coloration suitable to a ballroom would be out of place in a church, and the detail, or cleverness of manipulation, which may give value to a water-colour painting intended to be hung near the eye, is absolutely out of place and even harmful in a fresco or tempera painting upon a wall, which would naturally be viewed from a distance; and one may go farther and assert that the choice of forms and modes of arranging the objects which together form the composition must be regarded from quite different points of view, and that such

matters as the treatment of light and shade and the sequence and opposition of the masses of colour must also have different and special consideration. The fine qualities of a wall-painting may often be transferred with advantage to works which are not designed for special places, but those qualities which are frequently considered to give special value to easel pictures are useless to the designer and executant of mural paintings, who must depend for his effects upon careful arrangement and balance of colour and the resulting tonality, not upon the successful rendering of aërial perspective; upon suavity of line and vigour or grace of silhouette, not upon the clever drawing or foreshortening of the figure; upon a defined and broad technique instead of dexterity of manipulation, and the suggestiveness of incompleteness. And it is a curious fact that although fresco was not the earliest mode of wall decoration used (at least in historic times) the conventions imposed by the employment of that medium, that is to say those ways of working which are demanded if the painter is to do his work successfully, and with a tolerable amount of comfort, are with one exception useful and helpful to the mural decorator who uses some other medium; that exception being the difference in the colour when wet and when the plaster has dried, which makes it difficult to match the work of one day in colour and tone with

that of the day preceding. The sweeping outline which gives such dignity to groups is an advantage to the fresco painter, since it makes the cutting of the superfluous plaster when the day's work is finished easier, the simplicity of colour caused by the restricted palette gives a unity and breadth to the general effect, the necessity of finishing each portion while the plaster is still wet prevents the over-detailing of parts which would damage luminosity and darken instead of decorating the wall.

Another point which bears upon the general subject may here be mentioned, viz. the fact that all mural painting must be decorative or a failure, that is to say, that the painter must approach his subject from the point of view of realism only so far as is necessary to suggest his intention, but must consider every detail in its form and colour as part of the decoration with scrupulous care. To take an instance from a well-known work—the background of Puvis de Chavannes' "Girlhood of S. Geneviève," in the Panthéon at Paris, is a suggestive landscape, but its value in that composition lies in its beautiful colour and in the forms of hill and tree, and not in the least in the effect of nature which happens to be well rendered.

A French authority on fresco speaks thus: "An artist who would be great in the painting of mural

pictures must not be allured from genuine art by the prejudices of the time in which he lives. A pretty style of decoration may minister to the caprice of a passing fashion, but it would ill accord with the nervous and masterly mode of fresco." Mr. Armitage, R.A., when lecturing to the Academy students, also spoke with no uncertain voice on the qualities necessary for the successful production of large mural paintings. "The great mistake most artists make when they have a large wall-space to decorate with figures, is to proceed in the same way as they would for an easel picture. Elaborate finish, powerful light and shade, expression and individuality in the heads, are all excellent qualities in an easel picture, but they are by no means necessary in decorative work. On the other hand, a well-balanced and harmonious composition, a pure and grand style of drawing, and a great breadth and luminosity of colouring are absolutely essential for good decorative work. These are all qualities which are never got by dexterity of hand, dodges about colour, or chance, to which much of the fascination of oil painting on canvas must be attributed. They are only obtainable by patient and laborious work." "The decorative painter ought always to bear in mind that his work is supplementary to that of the architect. The very word 'decorative' implies subserviency to that which has to be decor-

A portion of the Castle of Frederick of the Empty Pockets.
THE "GOLDENES DACHL," INNSBRUCK.

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ated." I extract also a few of the hints on composition which he gave as being very useful to the student. "Beware of concave lines for the outlines of your groups. Avoid sharp angles, particularly right angles, unless you wish to draw especial attention to them. Be very careful about the relative position of the heads, so that, viewed as points of interest, they do not form any geometrical pattern. Convex lines are generally associated with forward movement and concave with retreat. Right angles in a group of figures convey the idea of immovability. The lines and general grouping, as well as the arrangement of light and shade, should be arranged with a view to expressing the subject with dignity and grandeur. Accessory figures, however good in themselves, if they mar the general effect, must be sacrificed. The art of good grouping is not of spontaneous growth. Simplicity and grandeur are not always synonymous terms, as witness the street architecture of the Georgian period."

A writer in the *Art Journal* at the time when the decoration of the Houses of Parliament was under consideration, who evidently held a brief for fresco as against other modes of wall-painting, expressed admirably many of the characteristics which should be found in paintings executed on the wall in any medium. He says: "It is clear that fresco is not

adapted for any such branch of art as requires principally strong effects of light or shade or colour aiming at producing illusion, and such effects should be avoided as resulting in certain failure. On the other hand, fresco essentially possesses the power of representing form and figure, all that can express thought, idea, character, and is perfectly adapted to any undertaking which acknowledges these as its legitimate object." "Architecture gives the general forms, to enliven without destroying them is the task of fresco painting. Its subjects must make, therefore, no appeals to the sense's illusion, nor aim at being mistaken for the reality; the highest object should be poetic and artistic truth." "The space painted seems enlarged by light colours and appears loftier, more free and cheerful. The absurd custom of totally transforming and destroying the architectural surface by means of perspective and optical trick, so as to apparently raise the roof of a hall, or of a church having a flat roof to a cupola, etc., commenced during the decline of the art under Correggio, and is most remarkable in the period of Andrea Pozzo and his contemporaries. To transfer the effect of oil to fresco destroys every principle. The inevitable result is dry, dull, heavy shades, the destruction of the architectural surface, and finally want of light and quality of colour." "The excellence of fresco painting must essentially depend

upon the creative power of the mind. To think in little would be as useful here as to war in little. Fresco is adapted to represent, with force and beauty, a great idea; it is not so well adapted to reproduce the scenes of nature, or to depict the affections, the feelings and the ties of social life. The *chefs d'œuvre* of painting are in oil—the grandest compositions are in fresco." The writer goes on to enumerate several of the special disadvantages under which decorative painters laboured in England—disadvantages which are happily less at the present day than at the time when he wrote, though quite great enough still.

"Religion does not consecrate the offerings of their genius by placing them within the precincts of their temples; the legislator is palsied by the fear of their direct encouragement; nor have they, as they merit, the advantage of public sympathy and support."

At the time when painting was beginning to revive after its sleep of conventionality, and the growing power and wealth of the communes aroused that emulation which gave birth to the great schemes of building and decoration, the wrecks of which are to be seen in so many towns in Italy, how different things were! Then nearly all the wall-paintings executed were painted either upon the walls of churches or

of communal buildings, and the town which had given birth to a painter of talent esteemed itself happy in finding him employment for the term of his natural life. And the painters for their part realised the nobility of the part they were called to play, and the assistance which their works might lend to the cause of education as well as to the decoration of the buildings which enshrined them, and, at least officially, held the standard high. Listen to the commencement of the statutes of the Art of Painters of Siena, dated 1355, but representing an older tradition, since the historians of the city say that they had already enrolled themselves as a corporation in the twelfth century. "Since, by the grace of God, we are teachers to ignorant men, who know not how to read, of the miracles performed by virtue of the Holy Faith, and the foundations of our faith are principally laid in the adoration and belief of One God in Trinity, and in God of infinite power, infinite wisdom and infinite love and mercy: and since no undertaking, however small, can have a beginning or an end without these three things—that is without the power to do, without knowledge, and without the true love of our work—and since in God every perfection is eminently united: now to the end that in this our calling, however unworthy it may be, we may have a good beginning and a good ending in all

our words and deeds, we will earnestly ask the aid of the Divine Grace, and commence by a dedication to the honour of the name, and in the name of the most Holy Trinity." The Florentine Compagnia di S. Luca in its statutes, as printed by Baldinucci, was inspired by much the same spirit. "We order that all those who are or shall be inscribed in this society, men or women, shall be contrite and have confessed their sins, or at least have the intention of confessing as soon as may be, and that the Captains and Chamberlains who enter their names shall inform them of this. And whoever is received into this society is bound to say every day five Pater Nosters and five Ave Marias, and if through forgetfulness or by any press of business he does not say them every day he must say them the next day, *or when he remembers.* And let it be manifest to all that our intention is that these statutes shall not bind anyone to crime, but that each one shall do as much good as he can or knows how according as God and his mother and the Blessed Messer S. Luke may give him grace." In 1395 it was ordained that on July 22nd they should meet in the chapel of S. Luke, and that the Captains should pay, and make each one who was able to do so also pay, two soldi, and this money was to be given to the priests to pay for the wax candle which was to be placed there, and all those present were to "devoutly keep

silence and pray to God for the souls of faithful Christians dead, passed from this life, and specially for those of this company which may be in purgatory; that God will lead them to the blessings of eternal life." With such regulations governing the Guild of the Painters the opening words of Cennino Cennini's "Trattato" are in harmony: "Ye of gentle spirit, who are lovers of this art and devoted to its pursuit, adorn yourselves with the garment of love, of modesty, of obedience, and of perseverance." The most scrupulous honesty was prescribed in the use of colours, and though wags like Buffalmacco might occasionally supply themselves with wine by humorous expedients, it was considered an act of criminal dishonesty, punishable by fine, to employ any but the best colours: "Any member of the guild who should dare or presume to use in his works any gold, silver, or colour other than he may have promised to employ—as, for instance, alloyed gold for fine gold, tin for silver, cobalt blue for ultramarine, indigo for azure, red ochre or carmine for 'cinabrese'—should be punished and fined upon every conviction ten 'libri.'" Cennini also insists upon the use of good colours as a religious obligation, and most especially in portraying the Virgin. Even if the painter was underpaid for his work "God and Our Lady will recompense him in the soul and in the body"! It is scarcely necessary to point out how

External wall-painting at Hallstadt.

SCENES FROM THE PASSION.

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different all this is from the temper which prevails in the most cultivated art centres among the students of the present day. And most of the fruit produced is of the different kind which is to be expected from such different roots. In those days, too, the learning of the craft of painting was much more serious than it is now. There was first a year of trial to see if the youth had sufficient promise and industry to make it worth while to teach him. If the master was satisfied, the boy was then bound apprentice for *twelve* years. He was sworn never to divulge the secrets of the art till, having become a master himself, he had apprentices, to whom he would then teach them, first binding them by a similar oath to that which had been administered to himself. Now a few years in an art school is considered sufficient equipment to enable the aspirant to wrestle with the most difficult problems, though, tradition being dead, he cannot have the advantage of having seen those problems approached from different points and solved more or less successfully by his masters. Professor Max Koch of Berlin, in a paper in the *Zeitschrift für Bildende Kunst* on the training of the decorative painter, strongly advises him to spend most of his time in "room-painting." He says: "The trained room painter has no fear of technical difficulties. He has used lime colours from his youth; he has

painted his studies with tempera and cheese-medium, and also knows the more easily learnt oil technique. He knows all about the mediums which he uses and how they behave, leaves alone the long-winded treatises which teach new things upon all possible painting processes, and makes his medium by the receipt which he learnt in the workshop and has himself often tested." He gives further advice which is worth quoting: "It is often the case that weak young men who are no good for handicraft wish to become decorative painters. This is a mistake. I can from experience assure them that painting on the ceiling is no child's play. They had better learn how to paint rooms, so that they may work earnestly; the iron 'must' of life will teach much better than an art school. They should study the works of the German, Italian, and French ornamentists." "The architect generally conceives the general scheme (of decoration) and gives the painter a sketch of wall, roof, or other architectural form which he thinks of decorating with painting, and leaves him free to give his fancy rein. A mistake is often made by architect, sculptor, plasterer, and painter, each striving to put as much as possible of his particular form of art into the space, and thus gain a greater part in that whole which is to be made beautiful by sound judgement. The scheme settled, two very important

questions arise—the cost of the work and the time required to carry it out. Now one sees the value of practical training. The trained room-painter has seen before how such a thing may be done, and lays down the right scale at once. He also knows approximately how much colour will be required, where to use the cheap colours, and how to give the greatest effect to the dearer ones. He knows further what scaffolding is necessary and what secondary things, and makes himself pleasant to the client from the beginning. After the sketches the studies and cartoons must be prepared in the studio, for the painter must be ready with everything on his scaffold if he is to gain credit or profit from his enterprise."

To return to the mediæval practice. The materials to be used were frequently specified in the contracts, those of the most expensive kind being specially charged for or provided by the patron as in classical times; the traditions from which were handed down by way of Byzantium and Mount Athos, and certainly formed the groundwork of mediæval practice. M. Didron says: "In the eighteenth century the painter of the Morea continues the tradition and traces the designs of the Venetian painter of the tenth, and the painter of Mount Athos of the fifth or sixth centuries. The costume is everywhere and in all times the same, not only in form but in colour and design, even to the

number and thickness of the folds. The places to be occupied by certain figures or scenes were fixed by rule, and the only point in which the Greek master was free was in his execution." The art being so entirely traditional, M. Didron's account of the processes employed in painting certain frescoes in a church at Mount Athos which he saw in use becomes of the greatest possible interest, the extreme rapidity and certainty with which the work was executed showing that the painter was doing that which he had learnt traditionally, and most probably using the same materials and processes as those used by Giotto and his followers, and the yet more ancient wall-painters of S. Angelo in Formis near Capua. In the first case the artist was decorating the narthex assisted by his pupils. "A young monk spread the mortar, the master sketched the subject, the first pupil filled in the colours within the outlines in the subjects which the master had not time to finish, a young pupil gilded the nimbi, painted inscriptions, and made ornaments, two others, smaller, ground and mixed colours. *In an hour* he drew a picture representing Jesus Christ giving his apostles the mission of evangelising and baptising the world. The Christ and the eleven other personages were nearly life-size. He made his sketch from memory without cartoon, drawing, or model. On being asked if he had done the

others round in the same manner he said 'yes,' and added that he very rarely had to alter a line. *These were certainly better than those of our artists of the second rank who do religious pictures.* His memory was prodigious. He dictated to the second pupil the inscriptions, etc., without book or notes, and they were the same as I had seen elsewhere." In another case "they allowed three days to pass between the laying of the plaster (the under-coat, one supposes) and the painting to allow the damp to evaporate. Before drawing, the master-painter smoothed the lime with a spatula and then with a thread determined the dimensions of the picture. The outline was traced in red. Inside it a black ground was laid, heightened with blue, a flat tint. On this he painted draperies and other ornaments, not touching the flesh. The master worked at two figures at the same time, going from one to the other. First a blackish colour, then with yellow, the flesh properly so called. The first coat extinguished the black, the second rounded the figure. A third coat of this pale yellow, thicker than the other, gave the general tone of the carnations. The eyes alone were reserved, a coat being passed over the whole surface. Then with pale green he softened the black of the shadowed parts which he had enlivened with blue. Then with yellow he restricted the encroachments of the green. He then made the

cheeks, lips, and eyelids rosy, and with dark brown put in eyebrows, hair, and beard, and the line of the face. The eyes were touched with white and the black strengthened, and with pale rose he gave the luminous point of the eye. The lips and mouth were lightened and finished, and a thick black line run all round the figure. A few strokes of the brush of a rosy white were added here and there to lessen and pale the vivacity of the reds in some of the veins, some brown touches to make the wrinkles in old men, and a few finishing touches of various colours. In *five hours* Joasaph painted in fresco a Conversion of S. Paul, nine feet broad and twelve feet high, with twelve figures and three large horses." No palette was used, the separate colours were in separate pots, and the brush was dipped first in one and then in the other, the colours being tried on the nimbus. The raising of nimbi was begun with a string dipped in plaster and fixed on the line traced with the primitive compass, made of a reed doubled over and fixed at an angle with a piece of wood. "When the lime is almost dry they finish by adding gold and silver to the dresses, and the finer colours are added—especially Venetian blue—flowers and ornaments, diapers, etc., it being necessary for the lower colours to be dry lest they should soil them. Another painter does the lettering and all is finished. They do not use oil,

because that requires the plaster to be quite dry, and as the colour does not penetrate the lime it is less firm. For the most important subjects, such as a Last Supper or a Crucifixion, the master does all, and there is not the division of labour described above; but one sometimes finds fine figures of Christ or the Virgin with other personages near quite mediocre—in this case the pupils have done their part as well. The treatise from which the painters work is divided into four parts. The first, which is technical, gives directions for preparing brushes and colours, spreading plaster for frescoes and panels, and painting on these plasters. The second contains a list of subjects of symbolism, but especially of history, which may be represented by painting, with copious descriptions of each subject. The third gives the places in which the subjects or personages should be placed in a church, a porch, a refectory, or a fountain. An appendix fixes the character of Christ and the Virgin, and gives some of the inscriptions which abound in Byzantine paintings. The forms of hair and beard, the age, physiognomy, costume, attitude are all marked in this book." The founder of the school is said to have been Pauselinos, who lived in the eleventh century, and since on Mount Athos there were in Didron's time "935 churches, chapels, or oratories, almost all painted in fresco, and filled with pictures on panel, while in

the great convents the greater part of the refectories were also covered with mural paintings," one can easily understand how the tradition lasted for centuries, the art of the Greek Church being a matter of religious dogma in all that concerns arrangement and type.

Professor Koch thus defines the difference between the easel-picture painter and the painter of mural decorations: "I call the painter 'decorative' who adorns the architecture on the surfaces of wall or ceiling with painting. I understand by the term 'Lower Art' or 'easel painter' the artist who puts upon canvas with colour and brush what his eye or his fancy pleases, sends his work in a gold frame to the picture exhibition, where it is then bought by some purchaser and can be put in a place for which it was not planned. The decorative painter is often assigned a definite place to fill and has to make the whole composition painter-like." The easel-picture painter is trained to the imitation of nature, often as an end instead of a means to an end, and in a portable object of this kind the æsthetic mistake is not very visible, but transfer the technique or strive to realise the same aim upon the wall and the failure from the point of view of Abstract Art becomes painfully evident. It is forgotten that as Professor Baldwin Brown says: "mere imitation of nature is not in itself artistic,

though it brings into existence the raw material of art. The imitation is only made artistic by the operation of the controlling law of composition." This is not a mistake made only in modern times, the craftsman has always rejoiced in getting as near to nature as possible, and "from the very beginning of art history, so soon at least as the carver or painter had attained some success in the imitation of nature, the popular eye has looked at his work almost entirely as representing nature," a matter of little importance when detached and movable objects only are in question, but when permanent decorations which cannot be removed from their places are produced it becomes of great importance that true principles should govern their design and execution. One must repeat that the painter whose principal ambition it is to realise the appearance of nature, giving her subtle aërial perspective by the accurate rendering of delicate gradations of tone as the various objects sink farther and farther into the sea of light and atmosphere which bathes every natural scene, and in a less perceptible degree the personages composing nearer groups—in so far as he attains his aim produces that which is unfit for mural decoration—since his success means the appearance of an opening in the wall through which the scene he has represented may be viewed by the spectator; whereas the object of mural decoration

is obviously the decoration of the wall-surface, not its removal. The frescoes of Mantegna in the Eremitani church at Padua show the only possible way of employing a mode of painting with considerable use of realism without much offending one's æsthetic sense. Here the pictures are framed within architectural forms, so that if the pictures were indeed spaces through which the scenes depicted were viewed, the roof would still be supported by the architectural skeleton of column and entablature which serves as frame.

The habit of mind engendered by constant striving after success in realising the effect of natural objects, is not only unhelpful to the painter whose business it is to decorate a wall-surface, but actually harmful, since it diverts his mind from the consideration of those problems which it is imperative that he should meet and solve. It can scarcely be too strongly insisted on, that while nature must necessarily form the basis of the painting, and the most earnest study of form and colour must precede the attempt to produce any work of decoration which is to be impressive, the imitation of nature is only useful in so far as it renders the meaning of the painter clear; and for the mural painter the question of a treatment in harmony with the surroundings of his picture, and of such a nature as to make his painting visible, either at a considerable

distance or at some strange angle, or in semi-obscurity as may often chance, is of infinitely more importance than the accurate representation of nature. And with this question of treatment is bound up the total effect of the conception of the general scheme, for it is quite easy for the painter to dwarf the proportions of a building, or to exaggerate any defects which it may have, by adding paintings which are out of scale in one way or another, or unsuitable to the style of design chosen: and he, in common with the other craftsmen whose work should combine to form an impressive and agreeable whole, must recognise the necessity of sacrifice, at the risk of producing a monstrosity, by the contest of each portion for supremacy.

Sir W. B. Richmond once said that "in decoration it was no use to copy nature: they must have learnt nature and have nature at their fingers' ends, and they must learn that lesson which came to them late in life, *i.e.* what to leave out." One is inclined to go even further, and say that the representation of nature is only important in as far as it assists the conception of the designer's meaning and produces beautiful line, form, or colour; and the more abstract the mode of representation chosen is, that is to say the fewer the means of expression which are retained, the more absolute must be the perfection with which the expression is made in those few. For instance, if figures

are painted on a wall in full light and shade and colour, faults in drawing may be pardoned if the colour is good, and the intelligibility of the whole is not much lessened by their presence though its beauty may be; but if the same figures are to be expressed in outline filled in with flat tints, the silhouette and drawing of the limbs must be better than before if an equal æsthetic impression is to be produced, and a greater care must be bestowed upon the arrangement of every line of the composition, since everything is displayed, whereas in the former case some portions would be salient and others more or less lost. "Beauty in works of art is of at least as much importance as truth," says Professor Baldwin Brown, "unless nature be made obedient to the æsthetic purpose, unless beauty result from the imitation of nature, such imitation is vain"—a sentence which one could wish dinned into the ears of artists, craftsmen and patrons, till it became part of their very being; in which case much fruitless labour would be saved, much waste of good money would be prevented, and the comparatively few who are not led by fashion in their admiration of art objects, would not have their feelings harrowed by the sights which now too often make them sigh. We want greater co-operation and sympathy between painters, sculptors, craftsmen, and architects. What Latilla wrote in 1842 is still much too true. "In modern times, sculptors and

architects in general have little regard for what is pictorial, and painters are not at all interested in what is architectural; and while the Italian rose in the united strength of the three, the artist of this day thinks nothing is to be derived from any branch but the one he owns."

RECEIPTS

In this volume the receipts for the most part are to be met with in the body of the work under the various processes in which they are to be used, but a few remarks upon the materials which analyses disclose the use of, and a few receipts for gilding grounds, may fitly occupy the place of this section.

First a receipt from a Byzantine MS. for wax painting by Didron:—Take size, a strong solution of potass and white wax in equal quantities, mix together and place them on the fire to dissolve. Add colour to the mixture; dilute the tint well and paint with a brush. Let the colour dry and then you can give it a polish. Gilding, if you use any, will become very brilliant; it is useless to add varnish. (He says the monks of Mount Athos still use this receipt.)

Mrs. Merrifield says that the paintings on the walls of the chapel of S. Jacopo di Pistoia were ascertained by Professor Branchi to have been executed on a ground composed of sulphate of lime (plaster of Paris), carbonate of lime, and a yellowish colouring

matter tempered with glue. It has also been ascertained that many of Luini's paintings in the Monastero Maggiore are not "buon fresco," but painted on white stucco in the ancient manner. The MS. of Alcherius gives the following directions for painting walls:—"Put a little lime with ochre that it may be lighter coloured, or mix it with simple red or 'prasin,' or with a colour which is called 'posce,' which is made of ochre, green, and 'membrayne'; or you may take of a colour which is made of sinople, ochre, lime, and 'posce,' etc. And walls should be painted rather moist than otherwise, because the colours unite together better and are firmer. And all the colours for walls should be mixed with quicklime (!)." This is probably the method of mural painting generally practised in the Middle Ages.

The mordant for gilding on walls and places exposed to damp was oil. Professor Branchi analysed some of the grounds of Benozzo Gozzoli's pictures where gilded. The intonaco was white and fine—a "denaro" (1·779 grammes) contained 0·576 gramme of a fine white sand mixed with a little argillaceous earth. The gilding in a picture by Buffalmacco is spread upon a layer of wax about half a line thick. (There was no indication that drying oil was mixed with it.) The gilding was probably executed (1) by applying on the smooth intonaco a kind of size soluble in

water and yellow in colour; (2) by applying a thin coating of wax on this, to which the gold leaf was affixed. The wax must have been dissolved in a volatile oil.

Jehan le Bègue's MS. receipt No. 190. How to lay gold on a wall or on parchments.—If you wish to lay gold on a wall, or on paper, or on wood, or upon a block of marble, grind gypsum by itself separately. Then grind brown separately in the same manner, and take three pints of gypsum and one of brown, and take glue made from parchment or leather, and distemper them together, mixing the said parts, and lay upon it (the object) one coat of this mixture with a paint-brush and then another; and so lay three or four coats. And when the last is dry, scrape it with a knife or other iron instrument fitted for the purpose, so that it may be very smooth; and then burnish it with a tooth or stone, and lay over it with a paint-brush only one very thin coat of the gypsum and let it dry. When it is dry lay the gold upon that mordant as you have been taught. Afterwards lay upon the gold a very fine cloth that has been two or three times warmed; or apply it as I do, not so warm, in order that the gold may be the better polished.

191. Also how to lay on gold.—Take gypsum and grind it well with water. Then take your glue, which

is made of bull skin, and mix with it a little white of egg, and distemper the gypsum. But when you wish to lay on the gold cover the place with gypsum with a brush and let it dry. Do this three times. Then scrape it that it may be smooth and burnish it, and again lay another coat of the glue or mordant upon it, and then your gold upon that, and remove the dirt gently with cotton, and then let it dry. But if you wish to polish it, do so with hæmatite or with a dog's tooth.

192. Also how to lay on gold.—Take brasilium newly distempered, with white of egg well whipped, with a sponge or otherwise, and draw and paint with it whatever you like on vellum or on any other thing you wish to gild, and immediately lay the gold upon it, and remove the dirt with cotton, scarcely touching it, and leave it to dry for half a day or a whole day if you like. Then take a dog's tooth and begin to burnish at first gently, lest you should spoil it all, and then harder, and afterwards so hard that your forehead is wet with perspiration.

194. Of the precautions required in gilding.—But take notice that you ought to work in gold and colours in a damp place on account of the hot weather, which, as it is often injurious in burnishing gold, both to the colours on which the gold is laid and in the gilding, if the work is done on parchment that is too dry and not

sufficiently moist; so also it is injurious when the weather is too dry and arid, or too damp while applying colours or gilding,

From the Bolognese MS. given by Mrs. Merrifield :—

To make a mordant for gilding on walls.—Take calcined bone, ground fine with weak glue, such as parchment glue, and let it dry; and when quite dry grind it up afresh with linseed oil and make it rather stiff; then take a little "liquid varnish" and incorporate it with the bone dust. Add to it a little saffron, sufficient to give it colour and make it rather stiff. When you wish to put the gold on the wall the mortar must be dry, and the mordant must not be applied too thick. Let it remain five or six days and then put on the gold.

171. A mordant for gilding on walls, etc.—Take litharge, verdigris, and a little ochre, and grind them with a little linseed oil and "liquid varnish," incorporate them well together, and then gild in the usual manner.

Gilding was often imitated by the use of less costly materials, such as silver or tinfoil varnished over with a yellow varnish or lacquer, the "sandarac" varnish so often mentioned in books on the beginnings of oil painting. At S. Jacopo, Pistoia, note is made of the use of thirty-seven pieces of tin, in the fifteenth century, while 7,000 leaves of gold were used. From

one ounce of gold the Roman gold-beaters obtained 750 square leaves and upwards, four fingers broad, as Pliny relates. Modern gold-beaters make 1,200. Cennini complains that in his time 145 leaves were obtained from a ducat in place of 100, and Vasari says that 435 leaves were made from three ducats, the same proportion.

A composition of quicksilver, tin, and sulphur, called "porporino," was used to imitate gold, and Jehan le Bègue gives full details of how to make "auripetrum," the tin with the varnish over it. "Spanish saffron, distempered with very clear glue or liquid varnish, and laid over very clear, that is, very bright and well-polished tin, assumes the appearance of gold to those that look on it, for it receives its colour from the sun, and its brilliancy from the tin, and thus may be made excellent auripetrum." Another receipt says that the saffron flowers should be treated with white of egg, into which the tin leaves are to be dipped three times, drying between and then polished with onyx and greased with linseed oil; and another gives myrrh and aloes, equal parts by weight, boiled together, as the colouring medium, into which the tin leaves varnished are to be dipped, and subsequently into a similar decoction of the middle bark of the black plum; and yet another gives linseed oil and resin and "vernix" (sandarac varnish).

No. 325 gives: A water proper for distempering all colours.—Take a pound of lime and twelve pounds of wood ashes; then take boiling water and put the whole together, making them boil well; after which let the mixture settle and strain it through a cloth. Then take four pounds of that water, heat it well, take about two ounces of white wax and put this to boil with the water, then take about half an ounce of fish glue, put it in water, and leave it until it is well softened, and, as it were, melted, when you must manipulate it until it becomes like paste, and throw it into the water with wax and make all boil together; then add to it about half an ounce of mastic and boil it with the other ingredients. Take some of this water on a knife-blade or a piece of iron to ascertain whether it be done; if it is like glue it is all right. Strain this water while hot or tepid through a linen cloth, let it settle and cover it well. With it you may distemper all kinds of colours.

No. 347. Water in which linseed oil has been steeped for a day and a night receives a glutinous quality from that seed which makes it proper for tempering colours.

No. 318 gives fish glue dissolved in good white wine as a medium for gilding on a ground of gypsum and sinople. This is somewhat akin to Pliny's "Leucophoron," a cement used for applying gold leaf to wood.

It was made of half a pound of Pontic sinopis, ten pounds of bright "sil" (attic ochre), and two pounds of Greek "melinum" (a white earth), well mixed together and triturated for twelve successive days.

S. Forni gives the following receipt for putting lines of gold and silver on draperies or feigned reliefs:— Make a mordant of wax, purified suet or tallow, gum elémi, turpentine, and mastic, in equal proportions, except the suet, which is to be half. Melt them gently in a pot, stirring with a wooden spatula. Then with a fine brush, and this mixture diluted with half its weight of essential oil of pine, draw the lines. When it is dry enough to be sticky apply the gold or silver. The next day dust off the superfluous metal with a soft brush of beaver or badger. If you cannot see the lines you are drawing you may stain the colour, with dragon's blood or minium ground very fine with essential oil of pine.

If the gilding is to be laid on aureoles or ornaments raised in plaster, give the surface two coats of size, and then with a mordant paint the shapes; leave it for twenty-four hours and then apply the gold leaf. The following two mordants are good, he says:—

Boiled oil . . .	339 grammes.
Venice turpentine . .	112 „
Naples yellow . . .	140 „

Warm the oil and mix the turpentine carefully with it, then add the Naples yellow ground in a little oil.

Boiled oil . . .	112 grammes.
Yellow ochre . . .	56 „
Minium . . .	28 „
Copal varnish . . .	56 „

Grind the ochre and minium together with the oil, then add the varnish. It does not last so well as the other, but can be gilded immediately.

Boiled oil mixed with yellow ochre and Armenian bole, ground together in equal parts to the consistency of syrup, may also be used. It is best when it has been kept a good while.

For making "caseum" for cheese tempera S. Forni gives the following:—It may be prepared by adding a little carbonate of potash or of soda to curds, but it is better to press the curds through a sieve or to dry them in a cloth to get rid of all the whey. Ammonia added makes a viscous cream which may be diluted with water. Keep the "caseum" dry in a glass bottle well stoppered, and mix with ammonia as required, first softening it with warm water.

Fig juice should be collected in October, and kept dried in drops in a glass bottle. When required as a mordant for gilding mix it with wine or liquid ammonia.

Blues and blacks made from charcoal require size as a medium. Yolk of egg makes the former green, and the latter do not dry properly.

Punches used for stamping patterns on gilded surfaces are better made of ivory than of either iron or steel.

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